REMEDIAL ACTION WORKPLAN
and
PROPOSED CLASSIFICATION EXCEPTION AREA
Kearny Smelting and Refining Corporation
Kearny, New Jersey

Prepared for:

Kearny Smelting and Refining Corp.
936 Harrison Avenue
Kearny, New Jersey 07029

Prepared by:

JMZ Geology
43 Emery Avenue
Flemington, New Jersey 08822

October 2000

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September 29, 2000

Mr. Ian Curtis
NJDEP
Bureau of Federal Case Management
401 East State Street
P.O. Box 028
Trenton, NJ 08625-0028

Re: Kearny Smelting and Refining Corporation

Report tiled **"REMEDIAL ACTION WORKPLAN and PROPOSED CLASSIFICATION EXCEPTION AREA"**

Dear Mr. Curtis:

Enclosed is an original and two copies of the referenced report. Two separately bound volumes contain the complete laboratory analytical reports. This report is submitted in accordance with an Administrative Consent Order dated September 16, 1991.

Based upon the conclusions of the enclosed report, Kearny Smelting and Refining Corporation will not be submitting any additional Quarterly Progress Reports. The next scheduled activity is monitoring well sampling planned for March 2001. The next report will be submitted by May 30, 2001.

If you have any questions, please call.

Sincerely,

Michael McGowan, PG
Geologist

enclosures

cc: Ms. Fran Rothschild, w/enc.
David DeClement, Esq., w/ enc.

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1.0 INTRODUCTION

Kearny Smelting and Refining Corporation (KSRC) is located at 936 Harrison Avenue in Kearny, NJ (see Figure 1). A number of remedial investigation and site evaluation activities have been conducted on the KSRC site since the Spring of 1993. These activities were summarized in the Phase II Remedial Investigation Workplan (RIW) submitted to the New Jersey Department of Environmental Protection (NJDEP) in October 1995 and the Revised Phase II Remedial Investigation Workplan (RRIW) submitted in August 1996.

A conceptual Remedial Action Workplan (RAW) for the site was submitted to NJDEP in May 1997. The RAW was implemented during the latter half of 1997 through the Spring of 1998. Post-remedial groundwater monitoring was conducted during November 1997 and February 1998. Additional groundwater monitoring was conducted during March 1999 and August 2000.

Based on the completion of site capping and the results of the post-remedial monitoring, a Remediation Verification Report (RVR) was prepared and submitted to NJDEP in September 1998. The RVR concluded that site remediation was complete and no further remedial or investigative actions were proposed. A current site map illustrating post-remedial site conditions is provided as Figure 2.

The Department issued comments on the RVR on December 8,1998. The Department required the submission of a Remedial Action Workplan (RAW) to address those groundwater contaminants with concentrations in excess of the NJDEP Groundwater Quality Criteria (GWQC) "which result from KSRC activities". Additional groundwater monitoring and the establishment of a Classification Exception Area (CEA) were also required. Subsequent correspondence (JMZ, 6/30/99; NJDEP, 8/17/99; D. DeClement 12/13/99) discussed appropriate means to develop an acceptable CEA based on site-specific conditions and concerns. On April 3, 2000, NJDEP issued its acceptance of the outlined approach to the CEA and RAW preparation.

The present RAW has been developed on the basis of the approach outlined in our correspondence with NJDEP. It includes a proposed CEA based on our current knowledge of conditions on-site and in the surrounding area.

2.0 DEVELOPMENTAL AND ENVIRONMENTAL HISTORY OF THE AREA

The developmental history of the KSRC site and the surrounding area as well as the effect that development has had on the local environment were discussed in previously submitted documents. It has been shown that the filling of the KSRC site and its subsequent use for various industrial purposes has paralleled the development of the surrounding area. It has also been shown that filling and development have resulted in ubiquitous regional degradation of groundwater. An important result of this regional history is the fact that all on-site sources of groundwater contamination do not necessarily "result from KSRC activities". This conclusion is supported by historical maps and photography.

The purpose of the following subsections is to provide further documentation of site and regional history. This historical evaluation supports the differentiation of those contaminants derived from KSRC operations and those derived from other sources both on- and off-site.

2.1 Additional On-Site History

Section 5.2 of the RVR included a discussion of a 1932 aerial photograph of the site and its surroundings viewed at the NJDEP Tidelands Management Program Aerial Photography/Historical Map Library. A copy of the photo with the current site plan superimposed is provided in Appendix A. The photo shows a continuous area of fill which encompasses the new warehouse footing locations and the areas to their north and east. A number of roadways cut across an area of older fill on the west of the warehouse location. These lead to four lobate areas of more recent, or active filling in the warehouse area and to the north and east. The photo corroborates the haphazard, multiple source dumping suggested by the fill stratigraphy.

Historical materials found in the fill beneath the plant establish that filling occurred prior to 1929 (see RVR), confirming that filling was complete approximately 15 years prior to the start of KSRC's operations. Dating of this material was based on the presence of light bulb manufacturing waste from the GE/Edison plant formerly located in Harrison. This date was corroborated by a 1938 work map by the Hudson County Mosquito Extermination Commission (HCMEC) which shows that nearly the entire site was filled by that time (see Appendix A). Other materials observed in test pits confirm that metal-processing wastes and other metal-bearing wastes were a part of the fill emplaced prior to the construction of the KSRC plant and prior to any on-site non-ferrous metal refining operations.

2.1.1 Extent of Light Bulb Manufacturing Wastes

The logs from wells MW-5 and MW-10 indirectly suggest that the same materials are present at both locations. The MW-5 log indicates "no recovery" in the split spoon samplers from 6 to 10 feet in the borehole. This is the interval in which the light bulb waste would be expected based on the depth of its occurrence in the warehouse footing pits. Based on JMZ Geology's previous experience with glass wastes, the "no recovery" indicated on the log is an expected result. No recovery is typical of glassy wastes which are generally crushed and pushed aside by both sampling spoons and augers. The log of MW-10 also indicates "no recovery" from

8 to 10 feet. This most likely represents the eastward thinning of the wedge of light bulb waste which was deposited from west to east. Again, this is corroborated by the 1932 aerial photo. Based on photographic evidence, light bulb wastes cover an area of approximately 1.5 acres.

2.1.2 Source of Nickel in Groundwater

Standard light bulb manufacturing at the time this material was placed on the site utilized nickel steel for the leading-in wires[1]. The leading-in wires are unprotected in the base of the bulb and encased in the glass filament stem between the base and the filament. In most of the bulbs and filament stems found in the footing locations, the bases were no longer intact and the leading-in wires had been completely lost to corrosion. Furthermore, the majority of the bulb waste had been crushed, resulting in increased exposure of the leading-in wires to the environment. In addition, marine lighting components that were also manufactured by General Electric at this same time were heavily plated with nickel[2]. The light bulb manufacturing waste placed in this area is the source of Ni found in samples from MW-5 and MW-10.

2.2 Regional History and Development

Previous discussions (RIW, RRIW) of regional history and development have focused on the importance of solid waste disposal, industrial development, and mosquito control activities as sources of contamination and causes of environmental degradation. Because the primary purpose of this discussion is to document upgradient sources of contaminants affecting the KSRC site, it will focus on four sites located to the east of the site. This study area is illustrated on Figure 3. It should be noted, however, that the site is surrounded on all sides by known contaminated sites. Appendix B provides a summary map of the known contaminated sites surrounding KSRC[3].

The sites on which this discussion focuses are listed below. The information discussed was primarily obtained through file reviews conducted at NJDEP headquarters in Trenton, and the NJDEP Metro Enforcement office in West Orange. Additional information was derived from the review and analysis of aerial photographs and historical maps. The complex history of the area is reflected in

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[1]. Sylvester, Cyril, and Ritchie, Thomas E., 1927, Modern Electrical Illumination, Longmans Green and Company, LTD.

[2]. General Electric Company, 1930, General Electric Catalog GEA-611A.

[3]. This information was previously submitted in both the RIW and the RRIW and is provided with this report for reference purposes.

the multiplicity of names assigned to the major landfills in the study area. For purposes of this report, the names first applied to the sites in question by Zurn Environmental Engineers in 1970[4] (see Appendix C1) will be used. The following sites are reviewed in this report:

Summary of Site Names

Zurn & this report	HMDC	NJDEP	Other
A1 Dump Component Sites: - Older Industrial Fill - Former Walker/Woburn Chemical Site - Universal Flavors	A1	Harrison Ave. Landfill	Harrison Ave. Landfill (Envirotech,1998) Interchange 15 W Disrupted Landfill, Route 280 Disrupted Landfill (NJ Turnpike Authority) Kearny Landfill (Cortell, 1991)
Kearny 1 Landfill Component Sites: - Older Industrial Fill - Former Swift Slaughterhouse - Central Salvage - Campbell Foundry Co.	1D Landfill	MSLA 1-D	Petrocelli Dump (HCMEC)
Kearny 2 Landfill	1-A Landfill	MSLA 1-A	

The history of these sites is complicated by the fact that filling and development that have often progressed in stages and have resulted in the superposition of environmental conditions. For example, the first two landfill sites each incorporate a number of separate and distinct component sites superimposed on the larger filled areas. This is further complicated by the use of different names by different investigators.

In addition to the files pertaining to the landfill sites and their component sites, the file on the Newark-Jersey City Turnpike remediation project was also reviewed.

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4. Zurn Environmental Engineers, 1970, Analysis of Alternative Solid Wastes Management systems for the Hackensack Meadowlands District; Hackensack Meadowlands Development Commission.

This "site", which incorporates the 6 foot wide area on the north and south sides of Harrison Avenue, runs the length of the study area from Schuyler Ave to the Kearny 2 Landfill.

In addition to showing the location of to these sites relative to KSRC, Figure 5 also shows the locations of the Kearny 3 (Keegan) Landfill, the Hewitt Foundry Dump, and the Glass Dump (Interstate Metals) in the area to the northeast of KSRC. These sites are known to be contaminated with metals and other contaminants and have been discussed in general terms in earlier reports. However, because their locations are side-gradient rather than truly upgradient relative to KSRC, file reviews for these sites were not requested and they are not discussed further in this report.

2.2.1 General Filling Pattern

The study area is roughly bounded to the north by the Erie Lackawanna and the Newark & Hudson Railroads, to the south by the Pennsylvania and Morris & Essex Railroads, and to the east Pennsylvania Tunnel & Terminal Railroad. It is bisected from east to west by Harrison Avenue (the Newark & Jersey City Turnpike), and from north to south by the DL&W Kingsland Branch, a Transcontinental Pipeline Company right-of-way, and numerous rail spurs. Modern roads such as the NJ Turnpike and Interstate Route 280 also cut across the area. Figure 4 illustrates these features.

A review of historical maps indicates that the filling of the study area generally proceeded from west to east. In 1839, Schuyler Avenue marked the approximate location of the marsh line. Filling of large portions of the marsh was preceded by elongate narrow fills associated with the building of dikes, plank roads and railroads as illustrated on Figure 4. These dikes and transportation corridors cut the marshes into numerous, irregularly shaped, closed areas which were subsequently filled for industrial development. Appendix C1 provides historical maps of the site area. Current tax maps are also included in Appendix C1 to assist the reader in identifying site locations.

The goal of the early filling of lands divided by transportation corridors was to create sites for industrial development. This filling was generally accomplished using industrial wastes consisting predominantly of ash, slag, and cinders, along with other solid manufacturing wastes, building rubble, rock and soil from construction sites. This early filling resulted in broad flat expanses of land with elevations suitable for the construction of buildings and the prevention of flooding. The KSRC site is a typical example of this early type of filling.

The large "sanitary" landfills which dominate the area today represent a relatively late form of filling that began in the late 1940s to early 1950s. The primary purpose of this type of filling was the disposal of large volumes of municipal waste. This method of filling resulted in the creation of large mounds of waste, some rising to heights greater than 100 feet above the surrounding marshland. The operation of these landfills in Kearny and the surrounding area was controlled by organized crime and as a result, large volumes of both liquid and solid hazardous wastes were dumped into these landfills[5].

Recognizing these stages of filling history is necessary in order to understand the complicated environmental conditions which now exist in the study area. The quality of the groundwater at the KSRC site is directly related to the filling history of and conditions originating in the surrounding landfills.

2.2.2 A1 Dump and Component Sites

2.2.2.1 A1 Dump

The historical A1 dump was first identified by Zurn Environmental Engineers for the Hackensack Meadowlands Development Commission in May 1970. The site location is shown on Figure 3.

The A1 Dump was listed by Zurn as a "completed" or inactive landfill. It was described as 135 acres in area and containing "15 to 30 feet of unburned refuse". Figure V-l of the Zurn report (see Appendix C2) shows the landfill as extending from the DL&W embankment (i.e., the eastern boundary of the KSRC site) eastward to the Transcontinental pipeline. As mapped by Zurn, the A1 Dump covers the following properties:

Block No.	**Lot Nos.**
275	1, 6, 7, 8, 9, 10
277	9, 10, 11, 12, 13
286	4, 4A, 5, 6A, 7, 8A, 9, 10A, 47, 47A, part of 49

Hartz Mountain Industries, Inc. is currently conducting remedial work on a portion of the A1 Dump in anticipation of development (NJDEP Bureau of Landfill Engineering, Landfill Facility No. 0907001434, Case No. 99-05-20-1332-27). In the current case file the site is referred to as the Harrison Avenue Landfill. The current remediation project is restricted to Block 286, Lot 4 (see Figure 5) and includes only 26.079 acres of the original dump area[6]. In addition to the remedial work currently being conducted on this small portion of the A1, landfill disruption

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[5]. Block, Alan A., and Scarpitti, Frank R., 1985, Poisoning For Profit: The Mafia and Toxic Waste in America, William Morrow and Company, Inc.

[6]. Cortell Associates, 1991, Environmental Evaluation Kearny Landfill Site.

and remedial work was previously conducted on portions of the dump associated with NJ Turnpike Exit 15W and the Route 280-Harrison Avenue interchange. Turnpike documents refer to the landfill as the "Interchange 15W Landfill" or the "Route 280 Disrupted Landfill"[7]. Files pertaining to these transportation related remedial actions have not been reviewed to date.

The site history as reported by TAMS[8] (1988) states that landfill operations began in the early 1950s and ceased in 1968 or 1969 with the construction of Turnpike Exit 15W. This statement is echoed by all subsequent site investigators. TAMS states that the landfill accepted both "household garbage and industrial waste" during this period. However, the history reported by TAMS only accounts for the large scale municipal waste landfilling operations most recently conducted on-site and does not address earlier filling operations (discussed in section 2.2.1.2 below). A 1940 aerial photo shows active filling and dumping at that time, including what appears to be an extensive drum-yard on Lot 9 (see Figure 5). Thus, the Zurn mapping (Appendix C1) provides a more accurate assessment of the entire filled area than that of subsequent investigators.

Municipal records appended to the Envirotech Consultants Remedial Investigation Report (1998) indicate that other on-site operations have had adverse effects on the environmental quality of the site. These include an auto wrecker's salvage yard and a drum recycling facility on Lot 5. Both of these operations were conducted contemporaneously with the landfilling.

Beginning in 1988, a number of investigations have been conducted on the site. These investigations have included the installation and sampling of test pits, soil borings, and approximately 24 monitoring wells testing both the shallow (above meadow mat) and deeper saturated zones. Envirotech (1998) includes a summary table of work conducted at the site; a copy of the table is provided in Appendix C2 along with summary tables of analytical results from the various reports.

The following contaminants were identified at concentrations exceeding the NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) in the investigations conducted by Cortell in 1988 and 1991. Subsequent soil sampling has focused on delineating the contamination found by Cortell.

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[7]. New Jersey Turnpike Authority, 1987, Final Environmental Impact Statement Interchange 11 to U.S. Route 46.

[8]. TAMS Consultants, 1988, Pre-Purchase Site Investigation Report.

Soil Contaminants	Maximum Concentration (mg/kg)
Metals: Sb	98
As	55
Be	4.4
Cd	46
Cr	560
Cu	9,900
Pb	6,500
Ni	520
Zn	51,000
PCBs	890
PAHs: Bis 2-ethylhexyl phthalate	290
Benzo A Anthracene	44
Benzo B Flouranthene	36
Chrysene	42
Petroleum Hydrocarbons (TPH)	580,000 (free product pool identified)
VOCs: Toluene	1,700
Trichloroethylene	1,100

Delineation soil sampling conducted by Envirotech[9] (1995) and Sadat[10] (1996) showed that metals concentrations in excess of the criteria were ubiquitous on-site but no discrete "hot spots" were present. Polychlorinated biphenyls (PCBs) were present at elevated concentrations in one discrete area. Four separate areas of elevated total petroleum hydrocarbons (TPH) were identified, one of which was a large accumulation of free product floating on the groundwater. In the Sanitary Landfill Disruption and Closure Plan[11] (1999) excavation and disposal of the soils in these areas, approximately 4,300 cubic yards in total, was proposed and subsequently approved.

The materials that have been identified in the refuse fill include decaying organic

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[9]. Envirotech Consultants, Inc., 1995, Kearny Landfill Soil Sampling Activities (letter to Karen Ricciardi of Hartz Mountain Industries, dated October 12, 1995).

[10]. Sadat Associates, Inc., 1996, Draft Remedial Investigation Report.

[11]. Envirotech Consultants, Inc., 1999, Sanitary Landfill Disruption and Closure Plan.

material, glass, cloth, paper, rubber, leather, plastics, demolition debris, concrete, asphalt, scrap metal, paint cans, containers, and numerous drums. Typically, this more recent refuse layer is underlain by older fill which includes burnt materials in an ash and cinder matrix. Cortell reports the presence of material described as "plating waste". In some locations, the refuse layers are underlain by meadow mat, in others, the mat is absent.

Groundwater investigations have identified the following contaminants at concentrations exceeding the NJDEP GWQC:

Contaminant		Maximum Concentration (ug/l)	Reference
Shallow Saturated Zone			
Metals:	Sb	25	Cortell 1991
	As	750	"
	Cd	83	"
	Cu	3,600	"
	Pb	13,000	"
	Hg	37	"
	Ni	1600	"
	Ag	48	"
	Zn	22,000	"
VOCs:	Benzene	5.7	Envirotech 1998
Deep Saturated Zone			
Metals:	Be	45	Sadat 1996
	Cd	27	"
	Cr	511	"
	Pb	564	"
	Ni	1125	"
	Ag	30	"

The Cortell results for metals are reported as "dissolved" concentrations; the Sadat report does not specify whether the concentrations represent dissolved or total values. These concentrations are an order of magnitude greater than the highest concentrations for each metal observed at the KSRC site.

Neither the Cortell or Sadat reports provide groundwater elevation maps. Cortell does however discuss groundwater flow, stating that the landfill topography controls flow and results in radial groundwater migration. Envirotech[12] provides

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[12]. Envirotech Consultants, Inc., 1998, Remedial Investigation Report.

maps of both the shallow and deep saturated zones and confirms the radial, topographically controlled flow in the shallow zone (see Appendix C2). Flow in the deep zone is to the north. Locally, the meadow mat appears to act as a confining layer separating the shallow and deep zones. However, in a number of locations the meadow mat is absent and the shallow and deep zones are in direct communication as confirmed by both Envirotech and Sadat.

Figure 6 is a compilation map illustrating groundwater flow directions in the study area. It incorporates flow data from the A1 Dump and the other sites for which flow data were available. The map confirms the upgradient location of these sites relative to KSRC.

The maximum surveyed elevation within the Hartz Mountain redevelopment site (see Figure 3) is 26 feet, 20 feet higher than the surrounding marshland. This elevation provides a substantial hydraulic head directing groundwater flow outward. Slug tests conducted by Envirotech yielded hydraulic conductivity values ranging from 23.2 to 52.4 feet/day. The radial flow in the shallow zone is consistent with the flow observed in the shallow zone at KSRC and confirms that the A1 Dump is upgradient from KSRC.

The Envirotech report states that leachate is discharging from the landfill into the wetlands to the north. Surface water samples collected in this area confirmed the presence of elevated levels of typical leachate parameters (Appendix C2). However, no discrete leachate samples were collected. Sadat and Cortell use the term leachate to describe all shallow groundwater on the site. However, while the measured pH of the groundwater samples is mildly acidic (pH ranging from 6.4 - 6.9), it is less acidic than typical of landfill leachates. Based on these pH measurements, Cortell concluded that 1) the landfill accepted more industrial and commercial waste than domestic refuse; 2) the leachate was "old"; and 3) no new leachate was forming.

2.2.2.2 Older Industrial Fill

The presence of older fill material at the A1 Dump is indicated by historical maps and aerial photos (see Appendix C2). The 1896 NJ Geological Survey Map of the Hackensack Meadows shows the entire area as unimproved marsh. The 1909 G.M. Hopkins Atlas of Hudson County shows that the western portion of the site has been developed and is occupied by several rail sidings and the Walker Chemical Company. The presence of industry is an indirect indication of filling. A 1938 HCMEC work map[13] shows that filling by that time had extended from the DL&W Kingsland Cutoff embankment on the west to the eastern end of Lot 9.

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[13]. Hudson County Mosquito Extermination Commission, 1938-1951, Work Maps.

Aerial photos confirm extensive early filling. A 1932 aerial shows active filling on the Woburn Chemical site (Block 277 Lots 12 & 13; this site is discussed in detain in Section 2.2.2.3). Road usage patterns show some material being brought onto the site from Harrison Avenue The majority of it, however, appears to be derived from the industrial operations being conducted on the site itself and spreads outward from the western and northern sides of the existing building.

A 1940 photo shows that Block 286 Lots 5, 7, and 9 have been completely filled. As noted above, there is also evidence of stockpiled drums on Lot 9. Active filling extends from the east end of Lot 5 approximately 400 feet into Lot 4. There is additional evidence of filling, grading and scattered dumping on Lot 49 as far east as the current locations of the Route 280-Harrison Avenue interchange and Turnpike Exit 15W. Active filling is apparent on Block 275 Lots 6 and 9.

Aerial photos from 1947 show renewed filling on the Walker Chemical site in an area measuring approximately 500 by 1000 feet between the DL&W embankment and the existing buildings (Block 277, Lot 12). On the east side of the buildings an extensive lagoon is evident. The water in the lagoon has a swirled, multi-shade appearance.

As noted in the previous section, subsurface investigations conducted at the A1 Dump identified an older fill layer consisting of burnt refuse, ash, and cinders, underlying the more recent municipal and industrial waste. This layer represents the older, pre-municipal landfilling material which was used to reclaim a portion of the site prior to the initiation of sanitary landfilling. This material is consistent with fill material found on the KSRC site.

The Cortell (1991) report dealing with the A1 Dump provides analytical data for samples collected at depth within the Hartz Mountain redevelopment site (see Figure 3). The samples were collected at different depths at each location. Soil boring logs indicate that some of these samples were collected from the older fill material. The concentrations of metals in these samples is consistent with both the concentrations found in the overlying recent materials and with the older fill material as sampled on the KSRC site.

2.2.2.3 Former Walker/Woburn Chemical Site

Reference has already been made to this site in the two preceding sections. It consists of Block 275 Lot 6, and Block 277 Lots 11, 12, and 13 (for convenience, this property will be called the "Woburn site" in the following discussion). The Woburn site is located immediately east of the DL&W embankment and KSRC. This portion of Kearny was the location of a number of meat packing and allied industries[14] beginning between 1901 and 1906 with the Swift Company, manufacturers of "glues, oils and fertilizers" as well as gelatin, tallow, grease and stock feed on Block 284 Lots 2 & 3. Swift was followed by Bimbler Van Wagenen, renderers of lard and grease on Block 284 Lots 3 (partial), 4, and 5 (partial); Schwarz Brothers, manufacturers of hides and tallow on Block 283 Lots 3 & 4; Theobald Animal Bi-Products Company, manufacturers of tallow, red oil, meat scrap, stearic acid, and soap on "the south end of Sanford St."; and the Newark Stockyards Company on Block 284 Lot 5.[15]

The 1909 Atlas of Hudson County[16] shows that Walker Chemical Company was operating at the Woburn site at that time. No information regarding the products or processes of the Walker Chemical Company was found in the NJ Industrial Directories. However, based on subsequent uses of the facility and presence of rails connecting the property with the Swift's Company slaughter house on the opposite side of Harrison Avenue, it appears that Walker was involved with the treating of animal hides and other slaughter house by-products. The 1918 Industrial Directory of NJ indicates that the same property was then occupied by the Woburn Degreasing Company whose operation is described as "grease extracting from leather". The 1923 Hudson County Atlas[17] confirms the presence of Woburn Degreasing and shows that the facility has been expanded to about twice its 1909 size. The locations of these industries relative to KSRC are illustrated on Figure 7.

Later editions of the NJ Industrial Directory provide additional information concerning Woburn Degreasing. The 1934 Directory describes Woburn's products as "oils, greases, fatty acids". The 1949 Directory lists the company as Woburn Chemical Corp., and indicates that it is affiliated with Woburn Chemicals, LTD. of Woburn Mass. The 1949 product list includes "specification fatty acids, synthetic

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[14]. Information regarding company names and product descriptions was derived from: New Jersey Department of Labor, 1901, 1905, 1909, 1912, 1915, 1918, 1927, 1931, 1934, 1946, 1943, 1949/50, 1952/53, 1954/55, Industrial Directories of New Jersey.

[15]. The Block and Lot numbers used in these descriptions are the current designations used by the town of Kearny and are provided for the readers convenience. The current Block and Lot number designations are different from those appearing on the older maps.

[16]. G.M. Hopkins Company, 1909, Atlas of Hudson County, New Jersey; Philadelphia.

[17]. G.M. Hopkins Company, 1923, Plat Book of Hudson County, New Jersey; Philadelphia.

drying oils, agricultural insecticides, other organic chemicals, leather and wool degreasing, technical solvents". Woburn Chemical was still active on the site in 1960[18].

The exact date that Woburn ceased operations there is uncertain. However, a series of aerial photos taken for the HMDC indicate approximate dates of cessation (see Figure 8). A 1972 aerial photo shows the facility fully developed and apparently operational. A 1978 photo shows that approximately half of the buildings have been demolished and the plant does not appear to be in operation. In a 1985 aerial photo, all the buildings have been demolished and the site is vacant. In these photos it appears that plant demolition debris and other plant derived wastes are being used to fill the low areas. Based on the aerial photos and the absence of files pertaining to this property at NJDEP-SRP, we have concluded that Woburn's operations ceased sometime prior to the initiation of the ECRA program on December 31, 1982.

No files have been found which pertain to specific site investigations conducted to evaluate the possible environmental degradation associated with the operations of Walker Chemical or Woburn Degreasing/Woburn Chemical. However, the information discussed below coupled with aerial photo evidence suggests that the operations of these facilities have resulted in environmental degradation.

Wastes associated with the processes used in these industries typically contain large amounts of arsenic and chromium[19]. Both of these metals have been identified as significant soil and groundwater contaminants in the A1 Dump investigations and at other sites in the area (see below). However, no specific source of these metals has been identified. Significantly, no typical Hudson County chromate waste has been found in the landfill, but leather scrap has been identified and is noted on some soil logs.

Material from the Woburn plant was used to fill the surrounding area as is evidenced by aerial photographs (see Figures 5 & 8). A 1972 photo show a partially-filled lagoon on the west side of the plant (Lot 12) and a large area of fresh fill on the east side of the plant (Lot 11). The material in both areas appears to be derived from the plant itself. Photos from 1978 and 1985 show the simultaneous demolition of the buildings active filling on the north, east, and west sides of the site (Block 275 Lots 1, 6, 8, & 9, and Block 277 Lots 11 & 12). The

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18. Meadowlands Regional Development Agency, 1960, Comprehensive Report of the Meadowlands Regional Development Agency; New Jersey Dept. of Conservation and Economic Development.

19. O'Flaherty, Fred, Roddy, William T., and Lollar, Robert M., 1962, The Chemistry and Technology of Leather: Vol. III - Process Control of Leather Quality.

fill material appears to be debris from on-site demolition.

The history and the resulting environmental conditions found at the Industri-Plex Superfund Site located in Woburn Massachusetts are directly analogous to those found in Kearny. At that site, extensive soil and groundwater contamination has resulted from the filling of marshlands with wastes derived from a number of meat packing industries including the Swift Company as well as successors and predecessors of Woburn Chemical[20] (see USEPA and Mass. DEP documents in Appendix C2).

2.2.2.4 Universal Flavors

The Universal Flavors facility was located on Block 286 Lot 7, the property currently occupied by Pharmachem, Inc. Information pertaining to the site is derived from a Discharge Investigation and Corrective Action Report (DICAR) prepared by ERM in 1990[21]. This site is often referred to as the Kohnstamm site, after a previous owner/operator. H. Kohnstamm & Company purchased the site in 1924 and begun bleach manufacturing. Later, bleach manufacture was replaced by flavoring and extract production. In 1988 the property was purchased by Universal Flavors, the manufacture of flavorings and extracts continues. In 1990, three underground storage tanks and associated petroleum contaminated soil were removed from the site under BUST Case No. 90-04-04-1453. The investigation included the installation and sampling of three monitoring wells. The DICAR, which was submitted to NJDEP in December 1990, recommended no further action. NJDEP approved the DICAR and the case was closed.

While the contamination associated with tanks was related to petroleum fuels and was relatively minor in extent, the DICAR provides some important information with regard to regional conditions. For purposes of this report, the following four points are noted. Supporting documents are provided in Appendix C2.

1. Groundwater contamination consisting of low concentrations of base/neutral extractable organic compounds (BNs) was attributed to regional industrial activity and historical sources. NJDEP agreed with this assessment and closed the case. (Note: No groundwater samples were analyzed for metals.)

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[20]. USEPA, 1986, Record of Decision Number EPA/ROD/R01-86/020; USEPA, undated, Industri-Plex Fact Sheet, Internet document located at www.epa.gov/region01/remed/sfsites/industi.html; Mass, DEP, 2000, Fax communication from Anna Mayer to Mike McGowan.

[21]. ERM Group, 12/1990, Discharge Investigation and Corrective Action Report, Universal Flavors, Kearny New Jersey.

2. Groundwater flow directions mapped by ERM confirmed the radial flow outward from the more elevated portions of the Harrison Avenue Landfill. Groundwater elevation maps also show that Frank Creek exerts little or no influence on groundwater flow in this area.

3. Well logs confirm the presence of historical (pre-sanitary landfill) fill materials.

4. The meadow mat is discontinuous. It is present directly below the fill materials at depths of approximately 6 - 7 feet in MW-2 and MW-3 but was not encountered in MW-1.

2.2.3 Kearny 1 Landfill and Component Sites

2.2.3.1 Kearny 1 Landfill

This site is the largest of the three sanitary landfills located upgradient of KSRC. An active site remediation program is currently being conducted on a portion of this site by the NJDEP Division of Publicly Funded Site Remediation. Our research shows that the current remediation site encompasses less than half of the original landfill area. The Zurn report shows the Kearny 1 Landfill consisted of 180 acres of which 105 were active, and 75 were completed. It was bounded on the north by Harrison Avenue, on the east by the Transcontinental Pipeline right-of-way, on the south by the Erie Lackawanna and the Pennsylvania Railroads, and on the west by the DL&W Kingsland Cutoff. The current remediation site consists of only 90 acres, that is, only that portion of the landfill to the south of the Interstate 280/Harrison Avenue interchange. JMZ Geology has reviewed the file pertaining to the current remediation project. Documents pertaining to the Kearny 1 Landfill and subsidiary sites are provided in Appendix C3.

The generalized history of the landfill presented in the Draft Background Investigation and Remedial Design Recommendations Report by Louis Berger Associates, Inc.[22], states that the landfill was active during the 1970s and 1980s. However, this is inaccurate and addresses only the portion of the site's active history during which it was operated by the Municipal Sanitary Landfill Authority (MSLA) under a lease from the town of Kearny. Other documents and aerial photos confirm that active filling was conducted as early as 1904. The early filling history of the site is discussed in Section 2.2.3.2.

According to NJDEP[23] sanitary landfill operation began in the 1970s. However, the

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22. Louis Berger Associates, Inc., 1999, Draft Background Investigation and Remedial Design Recommendations Report.

23. NJDEP, 1999, Remedial Action Plan MSLA 1D Landfill Site.

Zurn report indicates that the facility was accepting an average of 3015 tons of waste per week in 1968. This waste consisted of domestic garbage (13.6%), industrial waste (26.7%), commercial waste (3%), and demolition waste (56.7%). The report also provides the following description of the active operation:

> *The operation consists of approximately 180 acres. Of this 180 acre, approximately 105 acres are actively used as [disposal] area. The remaining 75 acres has been used as a disposal area, but substantial vegetation has already taken root on the reclaimed land. As of 1968 this operation was accepting about 3,000 tons of refuse per week from 29 communities.*
>
> *The operation had four bulldozers on the site. One drag line was available for excavating meadow mat, the predominant cover material. The operator was attempting to provide a sloped working face on a portion of the active area, but the working area was not well controlled to provide a well-defined, sloped working face. The abandoned, or inactive area, was dotted with recent deposits of large drums and other debris. Considerable areas of oil or chemicals were noted near these deposits.*

The following industrial, and some cases hazardous, wastes were dumped in the Kearny 1 Landfill[24]:

sludge waste (unknown content)	wet gas scrubber sludge
dredge material	pharmaceuticals
filter cake (lime based)	insecticides
plastic resins	asphaltic bottoms
deodorants	activated charcoal sludge
sewage sludge filter cake	wax
construction debris	fuel oil

In addition, approximately 1.5 million gallons of waste oil were disposed in this landfill between 1971 and 1979. As of 1999, the surface of the site was still littered with materials dumped after the close of operations in 1983, including tanks, chemical drums, and medical wastes (NJDEP, 1999).

Aerial photos indicate that large-scale sanitary landfilling began between 1947 and 1951 (see Figure 5). This filling began to the rear of developed parcels along Harrison Avenue and in the southeast portion of the site adjacent to the Transcontinental Pipeline. By 1961 large piles of waste covered most of the site. The main access road entered the site through Block 285 Lot 2. Wastes brought in

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[24]. Louis Berger Associates, Inc., 1999, Draft Background Investigation and Remedial Design Recommendations Report.

by this road were spread to the north, east, and south from the center of the site. A secondary access road entered the site through Block 285 Lot 1. Wastes brought in this way were spread outward from the southeast corner. To the north of the main fill and south of the developed parcels a large flooded area is present. The water appears to be covered with swirled slicks. A 1974 aerial shows that the formerly flooded areas are being filled. Filling is proceeding from the east side of Block 285 Lot 3 and from a new access road located between Lots 7 & 8. A 1980 photo shows Route 280 under construction. The central portion of the site has been regraded and the structures formerly present on lots 4 - 8 have been demolished. According to Berger (1999), the demolition waste from the construction of Route 280 was dumped in Kearny 1. The construction of Route 280 essentially cut the existing landfill in half. Large volumes of landfill material were removed from the interstate right-of way at this time. Information on the final disposition of this material was not included in the files made available to JMZ.

As a result of its long history and the extensive dumping of hazardous industrial wastes, the Kearny 1 Landfill is the most heavily contaminated site in the KSRC area. It produces a large volume of hazardous leachate which affects the regional soils, sediments, surface water, and groundwater. According to NJDEP (1999):

> *Contaminated leachate has been identified as posing the greatest threats to human health and the environment. [There is an] uncontrolled flow of leachate from the landfill into the groundwater and adjacent wetlands . . . Dark-colored, odorous leachate can be observed flowing from seeps in the landfill into adjacent wetlands on the south and east sides. On the north side, leachate seeps discharge along the curbline of Harrison Ave. The flow of leachate out of the landfill is estimated to be several hundred thousand gallons per day.*

The file provided to JMZ for review contained only two documents (Berger 1999, and NJDEP 2000) which provided analytical data pertaining to the site. The analytical data summarized in these reports was taken from a Final Draft Site Inspection Report prepared by NUS in 1990. The NUS report was not included in the file. A well record search found a single well record which indicates that monitoring wells were installed on the site as early as 1985. In 1990 NUS mapped the locations of four monitoring wells but only collected groundwater samples from one of them. No rationale for the reduced sampling regimen was provided. The following paragraphs discuss the contaminants present at concentrations exceeding NJDEP standards based on the NUS tables[25].

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[25]. NJDEP, 1999, Remedial Action Plan.

Leachate Contaminants

NUS collected four leachate samples from pools and seeps observed around the landfill. The leachate is an ongoing source of sediment, surface water, and groundwater contamination at this site and the surrounding area[26]. The complete NUS results summary table is provided in Appendix C3. Contaminants found in the leachate at concentrations exceeding the NJDEP Surface Water Quality Criteria (SWQC) and/or the GWQC are as follows:

Contaminant	Max. Concentration(ug/l)	Exceeds SWQC	Exceeds GWQC
Phenanthrene	780	not established	yes
Fluoranthene	860	yes	yes
Pyrene	1100	yes	yes
Benzo(a)anthracene	460	yes	yes
Chrysene	550	yes	yes
Benzo(b)fluoranthene	1100	yes	yes
Benzo(a)pyrene	550	yes	yes
Indeno(1,2,3-cd)pyrene	440	yes	yes
Benzo(ghi)perylene	430	not established	yes
beta-BHC	31	yes	yes
4,4'-DDD	71	yes	yes
4,4'-DDE	27	yes	yes
4,4'-DDT	71	yes	yes
Methoxychlor	47	not established	yes
Arsenic	7.3	yes	no
Chromium	262	yes	yes
Copper	490	yes	no
Lead	1250	yes	yes
Mercury	2.6	yes	yes
Nickel	427	yes	yes
Zinc	2360	yes	yes

Groundwater Contaminants

NUS sampled only one of the wells found on the site. The sample was designated GW-1 and was collected from MW-3 located near the southwest corner of the site. The NUS table is provided in Appendix C3. The following contaminants were found at concentrations exceeding the GWQC in sample GW-1:

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[26]. NJDEP, January 2000, Progress Report.

VOCs:
- Chlorobenzene
- Xylene

Metals:
- Chromium
- Lead
- Nickel
- (Note: no value reported for Mercury.)

The file did not include groundwater elevation maps. However, the Berger report states that groundwater flow occurs in a radial pattern from the topographic high. The occurrence of groundwater and/or leachate seeps on all sides of the landfill confirms this radial flow pattern. Consequently, the Kearny 1 Landfill is in an upgradient position relative to KSRC. The western portion of the original landfill as mapped by Zurn (1970) is located within 500 feet of the KSRC site.

Surface Water Contaminants

NUS Collected surface water samples from a wetland area located at the northeast corner of the site. The surface water samples contained the metals arsenic, chromium, copper, lead, mercury, nickel, and zinc at concentrations exceeding the NJDEP SWQC.

Soil Sampling

NUS collected 4 surficial soil samples at the site; no soil samples were collected below the surface of the landfill. The results showed no evidence of significant contamination in the current soil cap on the site (see Appendix C3).

2.2.3.2 Older Industrial Fill

Although large-scale sanitary landfilling did not begin at the Kearny 1 Landfill until the late 40s/early 50s, the filling of the site began much earlier. The presence of older fill material at this site is indicated by historical maps and aerial photos (see Appendix C3). The 1896 NJ Geological Survey Map of the Hackensack Meadows shows the entire area as unimproved marsh. As early as 1904 much of this area was filled with dredge spoils from the Passaic River.[27] The 1909 G.M. Hopkins Atlas of Hudson County shows that the western portion of the site has been developed and is occupied by several rail sidings and the Swift Company slaughter house. The presence of industry in formerly unimproved marsh is an indirect indication of filling. Of particular note is that the course of Frank Creek has been

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[27]. New Jersey Agricultural Experiment Station, 1904, Report on Mosquitoes.

changed to the west of the Swift plant. The summary Report of the HCMEC for 1912 - 1922 notes that a considerable portion of the area to the east of the Swift plant was again filled with dredge spoils from the Passaic River during 1921 and 1922.[28] A 1926 aerial photo viewed at the Bergen County Mosquito Commission Headquarters shows evidence of filling in the area to the west of the Transcontinental pipeline. A 1938 HCMEC work map shows that by that time filling had extended eastward from the DL&W Kingsland Cutoff embankment to the location of the Transcontinental pipeline.

Aerial photos confirm that extensive filling, including what appears to be industrial wastes had taken place by 1940. A 1940 photo shows that most of the site was recently graded. Large piles of material and stacks of drums are present on Block 284 Lot 7. Fresh material is being pushed southward from Block 285 Lot 4, and recently graded material is present on Lots 6, 7, and 8. As previously noted, 1947 and 1951 photos indicate that large scale sanitary landfilling began during that period.

Older fill material was identified in borings on the Central Salvage site located on Block 284 Lot 6 (see Section 2.2.2.4 for a more detailed discussion of Central Salvage). The materials identified included red brick, slag, ash, cinders, mixed soil, and broken rock. NJDEP (12/16/99) has stated the following about this site:

> *The entire site contains historic fill material that extends down to 5 feet below grade, which is approximately 1.5 feet into the ground water table. The fill material was found to contain total organic compounds, lead and cadmium above the Department's direct contact cleanup criteria.*

The metals lead, arsenic, and chromium have been identified at concentrations exceeding the GWQC in groundwater samples collected at Central Salvage.

2.2.3.3 Former Swift Slaughterhouse

The former Swift Company slaughterhouse was located on Block 284 Lots 2, 3, 4, & 5. This is currently the location of the Standard Tallow Company. Swift began operations on this site between 1901 and 1906. Swift is first listed in NJ Industrial Directory of 1906 as an abattoir, and later as a manufacturer of glues, oils, fertilizers (NJID, 1909), gelatin, tallow, grease and stock feed (NJID, 1934). File review requests for this site have found no records of any environmental investigations or remedial actions. However, due to its location on the western end of the Kearny 1 Landfill area, its long history of industrial operations, and the

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[28]. Hudson County Mosquito Extermination Commission: 1922, Summary Report: 1912 - 1922.

types of contaminants typically associated with meat packing and processing industries, some comment on its potential contribution to regional conditions is in order.

Historical maps show that the Swift site was filled prior to 1909. The 1909 Hopkins Atlas shows not only that Swift had a large plant on the site at that time, but also reveals that the course of Frank Creek had been altered to accommodate construction of the facility. The original meandering course of the Creek is represented by an irregular, hatched line marked "OLD B/L" on the current tax map (Appendix C1).

Reports and records of the Hudson County Mosquito Extermination Commission (HCMEC, 1914, 1952, 1959, 1960) indicate that discharges from the Swift Plant were a constant problem in the lower end of Frank Creek. Solid refuse continually clogged the tide gates downstream of the plant and organic pollutants caused increased mosquito breeding. While no specific data is available regarding the pollutants discharged by the plant, the records make it clear that discharges were common. Given the types of organic and inorganic contaminants associated with the meat packing and processing industry, it is likely that significant concentrations of contaminants exist at this site.

2.2.3.4 Central Salvage

The Central Salvage site is located at 1221 Harrison Avenue on Block 284 Lot 6. In January 1997, seven underground storage tanks containing petroleum products (fuels and oils) were removed from the site. A discharge was reported and BUST Case No. 97-01-28-0847-35 was assigned. During the course of the subsequent site investigations and remedial actions, significant soil and groundwater contamination unrelated to the tanks was identified. This non-tank contamination is representative of the regional environmental degradation in the area upgradient of KSRC.

As noted above, boring logs document the presence of red brick, slag, ash, cinders, mixed soil, and broken rock in the site fill material (Appendix C3). These materials are typical of the older industrial fill throughout the study area, including that found at KSRC. NJDEP has agreed that this material represents historic fill and has approved a Deed Notice for the site. The Deed Notice[29] encompasses the entire site and identifies TPH, lead, and cadmium as soil contaminants present at concentrations exceeding the RDCSCC.

Site groundwater is contaminated with BTEX and MTBE related to the underground storage tanks. In addition, the following metals derived from historic fill are

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[29]. NJDEP, 7/21/1999, Deed Notice for Central Salvage site.

present in the groundwater at concentrations exceeding the GWQC:

Metal	Max. Concentration(ug/l)
As	42.3
Cr	467
Pb	586

Groundwater flow has been consistently to the west throughout the investigations conducted to date. This is consistent with the radial flow from the Kearny 1 Landfill topographic high discussed by Berger[30] and further indicates migration of metallic contaminants toward the KSRC site.

2.2.3.5 Campbell Foundry

The Campbell Foundry site is located at 1235 Harrison Avenue on Block 284 Lot 7 (see Figure 5). Campbell Foundry Company used this site as a storage and maintenance yard for their main foundry facility located at 800 Bergen Street in Harrison. In addition to being used to store foundry stock, the southern portion of the site was used from approximately 1965 to 1981 to store foundry wastes including baghouse dust, slag, and casting sand[31]. The baghouse dust was listed as D006 (leachable cadmium), D007 (leachable chromium), and D008 (leachable lead) hazardous waste[32].

Site investigations began in 1988 with a NJDEP site inspection to evaluate whether the site was used as a landfill or a temporary hazardous waste stockpiling area. A review of aerial photos for the period 1965 through 1981 (see Figure 5) clearly shows landfilling during this period. In a 1957 photo poorly-defined older-fill material is present on the northern half of the site. By 1980 nearly the entire site had been filled and evidence of recent filling is apparent near the southern property boundary.

Site investigations have only evaluated the presence of cadmium and lead on the southern portion of the site. Fill materials identified include crushed stone, slag, glass, wood, and plastic[33]. Soil samples have been analyzed for both total and EPTOX/TCLP cadmium and lead. Both total and leachable cadmium concentration have been below the RDCSCC. Total and leachable lead concentrations have

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30. Louis Berger Associates, Inc., op. cit.

31. Hatcher-Sayre, Inc., 1989, Sampling and Analysis [Report].

32. NJDEP, 10/27/1988, Summary of Findings.

33. Hatcher-Sayre, op. cit.

exceeded the RDCSCC, the Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC), and the Federal hazardous waste maximum concentration level (MCL) throughout the study area. The maximum lead concentration in soils is 2800 mg/kg; the maximum TCLP lead concentration is 190 mg/l.

Groundwater investigations have included the installation and sampling of seven monitoring wells. Groundwater sampling identified the following metals at concentrations exceeding the GWQC:

Metal	Max. Concentration(ug/l)
Sb	99
As	82
Cd	340
Cu	1700
Cr	540
Hg	520
Pb	7100
Ni	310
Zn	7800

Groundwater elevation maps included with the current file indicate that groundwater flow has been to the west throughout the period of investigation. Again, this is consistent with the Kearny 1 Landfill radial flow discussed by Berger[34] and indicates migration of metallic contaminants toward the KSRC site.

2.2.4 Newark - Jersey City Turnpike

The Newark - Jersey City Turnpike project consisted of the investigation and remediation of lands extending approximately 6 feet to the north and south of Harrison Avenue from Schuyler Avenue on the west to the Pennsylvania RR crossing on the east (Figures 4 & 5). The work was undertaken by the New Jersey Department of Transportation (NJDOT) under the oversight of the Metro Enforcement Division of NJDEP in conjunction with a roadway widening project. Documents pertaining to this project are provided in Appendix C4.

Although limited in scope, this project provides important information regarding fill materials, soil contamination, and groundwater contamination stretching approximately 9000 feet from the original high ground at Schuyler Avenue to the eastern edge of the Kearny 2 Landfill. Thirty-seven soil borings and four monitoring wells were installed in the project area. Soil-boring and well logs confirmed the presence of historic fill materials throughout the study area. These include: slag,

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[34]. Berger, op.cit.

building rubble, coal, ash, cinders, brick, and wood. All of these materials are found at elevations below those of the adjacent sanitary landfills and all represent older filling associated with road building or industrial development. Soil contaminants found at concentrations exceeding the RDCSCC include:

Contaminant	Max. Concentration (mg/kg)
PCBs	1.6
Dieldrin	0.063
Aldrin	0.067
PAHs:	
Benzo(b)fluoranthene	9
Benzo(k)fluoranthene	8.2
Benzo(a)pyrene	5.8
Indeno(1,2,3cd)pyrene	3
Metals:	
Sb	15.2
As	23.9
Be	2.1
Cd	5.8
Cr	2200
Cu	2820
Pb	641
Zn	2720

As a result of the soils investigation, 5 areas of contaminated soil requiring remediation were identified. A total of 1,352 cubic yards of soil was excavated and removed from the site. Of this, 269 cubic yards were disposed of as ID-27 non-hazardous waste, and 1083 cubic yards were disposed of as D008 (leachable Pb) hazardous waste. In addition to the removal of these five areas, NJDEP required a Declaration of Environmental Restrictions which covered the entire project area.

Four monitoring wells were installed at widely-spaced intervals across the project area (Appendix C4). All of the wells were drilled to a depth of 12 feet, and screened from 2 to 12 feet. Wells MW-2, -3, and -4 encountered meadow mat and all were screened across the mat interval. The wells were sampled for Target Compound List (TCL) organics and Target Analyte List (TAL) metals. No organic contaminants were identified in any of the wells. Lead was identified at concentrations exceeding the GWQC in MW-1, -3, and -4. MW-4 also contained thallium in excess of the GWQC. Based on the contaminant concentrations in the soil, the presence of leachable lead, and the fact that contaminant concentrations in the groundwater from below the meadow mat are typically much lower than those above the mat at other sites in the area[35], it is likely that contaminant *concentrations in the shallow groundwater are higher than these results indicate.* None of the documents reviewed provided groundwater elevation maps or static groundwater level data.

2.2.5 Kearny 2 Landfill

This landfill is located on Block 286 Lot 33. It covers an area of approximately 50 acres[36]. It was designated Kearny 2 in the Zurn report, and has also been referred to as the "HMDC 1-A" or "MSLA 1-A" landfill. The landfill is bounded to the south by Harrison Avenue, the east by the Pennsylvania Railroad, the north by Belleville Pike, and the west by the eastern spur of the NJ Turnpike. Limited information was available in NJDEP files pertaining to this site. HMDC was also contacted for information regarding the site but no response has been received to date. However, available information indicates that this facility has had a significant affect on regional environmental quality. Historical documents pertaining to this landfill are provided in Appendix C5.

The Kearny 2 landfill was operated by the MSLA. A review of aerial photos and historical maps indicates that filling at this site began between 1961 and 1969. Prior to that time, limited filling for development purposes had taken place on Lot 39 to the south of the landfill. During the MSLA operation, the landfill received demolition waste (41%), industrial waste (29%), domestic waste (20%), and commercial waste (10%)[37]. MSLA operations ceased in 1974, but were re-activated under a contract with HMDC from April 1983 to April 1984. During that period an additional 6,263,000 cubic yards of waste were deposited there, raising the elevation of the site from 40 feet msl to 104 feet msl[38].

The facility ceased operations permanently in 1984. In 1985 HMDC prepared and submitted to NJDEP a Closure and Post-Closure Care Plan for the Kearny 2 landfill.

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35. For example, KSRC (see RIW, RRIW, and RVR); and A1 (see Envirotech Consultants, Inc., 1999, Sanitary Landfill Disruption and Closure Plan; Sadat Associates, Inc., 1996, Draft Remedial Investigation Report.

36. USEPA, 1995, Draft Environmental Impact Statement on the Special Area Management Plan for the Hackensack Meadowlands District, N.J.; US Army Corps of Engineers - New York District and USEPA - Region II, New York.

37. Zurn, op.cit.

38. Hackensack Meadowlands Development Commission, 1985, Site 1-A Landfill Closure and Post Closure Care Plan.

The plan included capping of the site, the installation of a perimeter dike/cutoff wall, a leachate collection system, and a gas venting and collection system[39]. According to the USEPA[40] the cap was installed in 1990. As of 1995, a leachate recovery system is in place and leachate is trucked to the Passaic Valley Sewage Authority plant in Newark. However, USEPA includes the site as a landfill "at which reclamation is underway", and it is not clear to what extent the closure plan has been completed.

The only analytical data available is a leachate analysis from 1991. The leachate contains the following contaminants[41]:

Contaminant	Max. Conc.(ug/l)	Exceeds GWQC	Exceeds SWQC
As	153	yes	yes
Cd	49	yes	yes
Cr	140	yes	yes
Cu	75	no	yes
Pb	150	yes	yes
Ni	199	yes	yes
Zn	153	no	yes
TPH	1,300	not established	not established

(Note: these results are all that the USEPA document provides. Results for the typical suite of leachate analytical parameters are not provided.)

Records of daily leachate quantities for the period of October 3 through December 31, 1988 indicate that the landfill produced an average of 37,875 gallons of leachate per day or 13,824,375 gallons per year. Up until the time the leachate recovery system was activated these contaminants migrated freely into both groundwater and surface water. Given the uncertain status of closure activities and the large contaminant mass, it is possible that leachate migration to the subsurface persists.

No groundwater analyses were included in the available files. However, the

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39. HMDC, op.cit.

40. USEPA, 1995, Draft Environmental Impact Statement on the Special Area Management Plan for the Hackensack Meadowlands District, N.J.; US Army Corps of Engineers - New York District and USEPA - Region II, New York.

41. USEPA, op.cit.

Closure Plan[42] included open-ended quarterly groundwater monitoring which is an indication that groundwater contamination is present. Similarly, no groundwater elevation or flow data were provided. However, based on the need for a perimeter cut-off wall, it is inferred that groundwater flows outward from the topographic high of the landfill in a radial pattern, as is typical of all the landfills reviewed.

An important consideration concerning the Kearny 2 Landfill is the fact that it lies immediately to the east of the ground-level portion of the eastern spur of the NJ Turnpike. In the construction of this portion of the Turnpike, vertical sand drains were used to dewater and stabilize the underlying meadow lands (see Appendix C5). These sand drains are 18 - 24" diameter sand filled borings extending from the surface to bedrock. The borings were capped with a thick blanket of sand. As fill was placed over the sand blanket the underlying unconsolidated deposits were compacted and the formation waters were pushed into and up the sand drains to be discharged to the surface through the sand blanket. The sand drains were a highly successful means of stabilizing the marsh soils.[43]

Major storms and the resulting destruction of meadow dikes during the 1950s, caused the meadows surrounding the sand drains to become permanently flooded. Under these new hydraulic conditions the sand drains became high-permeability infiltration conduits from the surface into all groundwater-bearing horizons in the subsurface. The sand drains are within 200 feet downgradient of the Kearny 2 Landfill. Our recent observations of the landfill found surface water in contact with both the western side of the landfill and the Turnpike sand drain system (see photos in Appendix C5). Thus, it is likely that large volumes of leachate from the Kearny 2 landfill have been conducted into the groundwater though these drains.

Of the sites reviewed, the Kearny 2 Landfill is the furthest from KSRC, lying approximately 1.5 miles to the northeast. As such, it may not be a direct contributor to the conditions observed at KSRC. However, its presence is important for the following reasons:

1). It forms the eastern end of a continuous line of contaminated landfills which extends from the KSRC boundary for a distance of over 1.5 miles in an upgradient direction.

2). It has historically produced, and continues to produce approximately 14 million gallons of hazardous leachate per year.

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[42]. HMDC, op. cit.

[43]. Porter, O.J., and Urquhart, L.C., 1952, Sand Drains Expedited Stabilization of Marsh Section, Civil Engineering, Vol. 22.

3). The Turnpike sand-drain system located immediately downgradient of the Kearny 2 Landfill provides a high volume, high-permeability conduit to carry leachate derived contaminants to all groundwater zones.

4). Hydraulic head from the flooded marshes drives the direct infiltration of leachate and increases the head in all of the groundwater-bearing units.

2.3 Discussion of Historical Evaluation

This historical review has identified eight specific contaminated sites upgradient of KSRC. All of the groundwater contaminants identified at KSRC have been found at higher concentrations at the upgradient sites. Furthermore, groundwater elevation data from these sites confirms the same westward flow of groundwater that is documented at KSRC and indicates that all of the sites are upgradient of KSRC. Investigations conducted by a variety of contractors for NJDEP, USEPA, HMDC, and private entities confirm that regional groundwater quality has been significantly degraded. In addition to supplying a large mass of dissolved contaminants, the sanitary landfills upgradient of KSRC also provide a greatly increased hydraulic head which drives contaminants outward in all directions. This historical evaluation confirms the conclusion drawn in earlier reports: that contaminated groundwater is entering the KSRC site from upgradient source areas to the east.

In previous reports, the only upgradient contaminated site identified and for which site-specific data was provided was the Kearny 2 Landfill. In a letter dated 8/17/99, NJDEP responded that, in their opinion, Kearny 2 was an unlikely source due to its distance from KSRC and the lack of groundwater elevation data confirming flow from the landfill. The information reviewed in this evaluation not only confirmed the possibility of migration from Kearny 2, but also identified additional sites lying between the landfill and KSRC. Groundwater analyses and groundwater elevation data from these sites confirm both the presence of numerous contaminant source areas and groundwater flow towards KSRC.

In the same letter, NJDEP also made the following comment:

> KSRC's argument that metals are migrating approximately 3,500 feet at levels greater than the GWQS is contradictory to KSRC's conclusion that natural attenuation (NA) will prevent the metals from migrating a significantly shorter distance off site.

The findings of the historical evaluation have identified a sound rationale and working mechanism that explains both the migration of metals from east of KSRC and the effective reduction of contaminant concentrations by NA at the site itself. Accordingly, three responses to the Department's comment are provided:

1). The historical review outlined above has identified eight upgradient contaminated sites which are sources of the same contaminants found at KSRC. The nearest of these is located immediately east of the DL&W embankment and within 100 feet of KSRC. Therefore, it is not necessary for off-site contaminants to migrate great distances to reach the site.

2). A continuous line of sites with known groundwater contamination extends for approximately 8000 feet on the upgradient side of KSRC. There are variations in flow directions associated with the topography and variations in concentrations typical of heterogenous fill materials found on these sites. However, groundwater monitoring results confirm that virtually all of the off-site groundwater upgradient of KSRC is contaminated with the same suite of contaminants that are found on-site.

3). Given the conditions that resulted from the historical filling of this entire area, there is nothing contradictory in the conclusion regarding NA. The two-stage filling conducted in the study area provides mechanisms for both the migration of high volumes of contaminants out of the sanitary landfills and for the attenuation of the same contaminants in the older fill areas. These mechanisms are described in detail in the following section.

2.4 Mechanisms for Migration and Attenuation of Contaminants

The historical evaluation documents two major stages in the filling of the area. The first stage involved the filling of marsh for the creation of land for industrial development. This stage of filling progressed from Schuyler Avenue westward and resulted in raising the elevation of the land to approximately that of Harrison Avenue. The materials used in this stage of filling were industrial wastes consisting of ash, slag, cinders, solid manufacturing wastes, building rubble, rock, and soil from construction sites. Industries were developed on this made-land along existing roadways. The second stage of filling was the creation of large sanitary landfills which began in the late 1940s and early 1950s. These were created in part on earlier fill and in part on unfilled marshland. These landfills were composed of municipal garbage, industrial wastes, and demolition rubble.

The difference in the materials in each type of fill plays an important part in controlling contaminant migration. As municipal garbage within the sanitary landfills decomposes, it generates a variety of organic acids (see Appendix C1)[44].

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[44]. Bouwer, Herman. 1978, Groundwater Hydrology, McGraw-Hill; and Gintautas, Peter A.,, Huyck, Kristina A., Daniel, Stephen R., and Macalady, Donald L., 1993, Metal-Organic Interactions in Subtitle D Landfill Leachates and Associated Groundwaters, *in* Metals in Groundwater, H.E. Allen, E.M. Perdue, and

Similarly, many other organic acids are derived from organic chemicals in industrial wastes under landfill conditions[45]. In addition, the documented use of meadow mat for daily cover in these landfills is another source of organic acids. The acidic conditions developed in the landfill increase the solubility of and mobilize the metals in the waste. Thus, the leachates are typically acidic, with "younger" leachates being more acidic than "older" leachates, and typically contain high concentrations of dissolved metals. Leachate analyses discussed in Section 2.2 above confirm that this is the case in the landfills upgradient of KSRC.

The actual structure of the landfills in this area also has a profound effect on the mobility of contaminants. Because these landfills are topographic highs with elevations considerably higher than their surroundings, they have a considerable hydraulic head which forces leachate both downward to the underlying groundwater, and outward. The outward component of flow results in both leachate seeps in the side of the landfills, and in the radial flow of groundwater into the surrounding area. These conditions have been documented at all of the sites included in the historical review, and are most apparent in the A1 Dump and the Kearny 1 Landfill.

Both the older fill and the more recent sanitary landfill materials were dumped directly onto the existing meadow surface or into open water with no impermeable liners in place. In the sanitary landfills, the meadow mat was commonly excavated immediately in front of the working face for use as daily cover. As a result, refuse was then dumped directly onto the underlying material, promoting flow into the lower water bearing zones. This fact has important ramifications in terms of contaminant migration because it means that the shallow groundwater in the older fill is in direct communication with leachate and contaminated groundwater in the more recent sanitary landfills.

As noted above, the older fill includes ash, cinders, and slag which typically contain high concentrations of metallic contaminants. These are all essentially mineral glasses with complex compositions[46]. They are prone to hydration reactions and sensitive to changes in environmental conditions. Slags are typically classified as "basic" or "acidic". However, this terminology refers only to the ratio of sodium and potassium when compared to magnesium and calcium as determined from calculated major oxide composition. In terms of its reaction with

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D.S. Brown eds., 1993, Lewis Publishers.

[45]. Gintautas et al, op.cit. This article cites a leachate sample from a New Jersey landfill as a specific example of this condition, see Appendix C1.

[46]. Bray, John L., 1947, Non-Ferrous Production Metallurgy, John Wiley & Sons.

water, slag is always alkaline[47]. Similarly, the majority of coal ash and cinder deposits are alkaline and produce alkaline leachates[48]. Although ash, cinders, and slag are also found in the more recent sanitary landfills, the presence of large volumes of decaying organic material creates an acidic environment. As a result, metals derived from these materials within the sanitary landfills are more readily dissolved and mobilized than those in the older fill. This is demonstrated by both the groundwater and leachate samples discussed above.

The most important factor in mobilizing and in precipitating metals in landfill conditions is pH[49]. Acidic leachate entering the older fill can be expected to increase the solubility of and mobilize the metals present near the point of entry. However, the alkaline nature of the older fill tends to neutralize the acidic leachate and allow for the precipitation of both the leachate derived metals and the metals mobilized from the older fill. Thus, it is the combined effect of the migration of acidic leachate into the more alkaline older fill the causes contaminants to migrate relatively long distances in the area east of KSRC and minimizes their migration once they have entered the site[50]. Figure 9 is a schematic cross section illustrating this effect.

The sanitary landfills located to the east of KSRC provide a large volume of leachate to drive the system outlined above. According to USEPA[51], data from the "Harrison Avenue Landfill" provided leaching rates of 540,000 to 670,000

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47. Josephson, G.W., Sillers, F., and Runner, D.G., 1949, Iron Blast Furnace Slag Production, Processing, Properties, and Uses; U.S. Dept of the Interior Bulletin 479.

48. Dudas, Marvin J., 1981, Long-Term Leachability of Selected Elements From Fly-Ash, Environmental Science and Technology, Volume 15, No. 7; and Scanlon, David H., and Duggan, J. Carroll, 1979, Growth and element uptake of Woody Plants on Fly Ash, Environmental Science and Technology, Vol. 13, No. 3.

49. Sandhu, Shingara S., 1990, Kinetics and Mechanisms of the Release of Trace Inorganic Contaminants to Ground Water From Coal Ash Basins on the Savannah River Site, US Department of Energy, Report No. DOE/SR/15170--3.

50. These mechanisms are described in the case study: see Sandhu, Shingara S., 1990, op.cit.; and in experimental studies: Theis, Thomas L., and Wirth, John L., 1977, Sorptive Behavior of Trace Metals on Fly Ash in Aqueous Systems, Environmental Science and Technology, Vol. 11, No. 12.

51. USEPA, 1995, Draft Environmental Impact Statement on the Special Area Management Plan for the Hackensack Meadowlands District, N.J.; US Army Corps of Engineers - New York District and USEPA - Region II, New York.

(average = 605,000) gallons/acre/year for the landfills in Hackensack Meadowlands. Because the A1 Dump is the closest to KSRC of the upgradient landfills, these values were used to calculate its contribution of contaminants to the site. Based on the original mapped area of 135 acres, and the average leaching rate of 605,000 gallons/acre/year, the A1 Dump produces 81,675,000 gallons of leachate/year. Because of the radial flow of groundwater and leachate from the landfill, one-quarter of this volume is hydraulically driven towards KSRC. Thus, KSRC receives 20,418,750 gallons of leachate per year (55,942 gallons/day) from the A1 Dump.

Hydraulic conductivities at the A1 Dump were measured at 23.2 to 52.4 (average = 38.1) feet/day[52]. The lower of these values most likely represents conditions in the older fill while the higher represents conditions where the sanitary landfill reaches its maximum elevation and supplies maximum hydraulic head. This is corroborated by the hydraulic conductivity of 21.8 feet/day measured in the older fill at the Central Salvage[53] site. Using the A1 Dump average hydraulic conductivity of 38.1 feet/day, it would take only 78 days for leachate or contaminated groundwater to migrate from the highest point on the A1 Dump (i.e., the location with the greatest downward hydraulic head) to reach the location of MW-9 at KSRC. Even at the hydraulic conductivity measured in the older fill (21.8 feet/day) only 137 days would be needed. Based on this data, even accounting for retardation, contaminants migrate from the A1 Dump to KSRC in a period of 78 to 137 days. The reduction of contaminant concentrations across the site indicates that KSRC is on the fringe of the plume derived from the A1 dump. Groundwater pH measurements made at KSRC indicate that the hydrogen ion activity decreases over a horizontal distance of 800 feet, defining a broad aureole of chemical change peripheral to the A1 Dump.

The historical information reviewed provides conclusive evidence of upgradient, off-site sources of the contaminants found at KSRC. The groundwater contaminants which have been identified on the KSRC site are present at higher concentrations on upgradient sites. Furthermore, at KSRC declining metals concentration gradients were observed parallel to the flow gradient. The mechanisms outlined above, which have been documented both experimentally and in actual cases, provide the physical means for the migration of off-site contaminants onto KSRC. This conclusion is supported by the groundwater sampling results, which are discussed in Section 3.0 below.

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[52]. Envirotech Consultants, Inc., 1998, Remedial Investigation Report.

[53]. Lutz Environmental Company, 1/1998, Remedial Investigation Workplan.

3.0 GROUNDWATER SAMPLING - AUGUST 2000

3.1 Groundwater Sampling

The first set of annual groundwater samples was collected on August 16 -17, 2000. By letter dated June 30, 1999, KSRC proposed annual sampling of wells MW-5, MW-7S, MW-9, MW-10, MW-11, MW-13, and MW-14. NJDEP approved this proposal with the addition of the wells MW-2SR, MW-4S, and MW-12. Accordingly, these ten wells were sampled for priority pollutant metals and the following geochemical parameters: dissolved ferrous iron, alkalinity, sulfate, pH, conductivity, dissolved oxygen, and redox potential. The wells were purged and the samples collected by technicians of STL using the "low-flow" methodology. The samples were analyzed by STL of Edison, NJ (NJ Certified Lab No. 12028).

3.2 Analytical Results

Sample analytical results are summarized on Table 2; the laboratory analytical report is provided in Appendix D. During this event, contaminants were detected in samples from wells MW-2SR, MW-5, MW-7S, MW-9, MW-10, MW-11, and MW-13 at concentrations exceeding the GWQC. Contaminant concentrations increased since the previous sampling event, and a corresponding decrease in groundwater pH was observed in all of the wells.

As noted in the RVR, groundwater contaminant concentrations declined in post-remedial groundwater samples. This decline was attributed to remedial actions conducted on-site. No new on-site sources have been added since that time. Therefore, the concentration increases and decreasing pH observed in the August 2000 samples are attributed to off-site sources. One potential off-site source is excavation and site work that began at the Hartz Mountain redevelopment site on the A1 Dump during the spring of 2000. The newly excavated areas were exposed to heavy rains during the spring and summer resulting in increased infiltration. This in turn lead to increased migration of metals and leachate.

The total metals sample from MW-14 produced an anomalous result of 152 ug/l lead. Previous samples from MW-14 contained no detectable concentrations of lead. Furthermore, this concentration exceeds the dissolved values for lead found in any well in all previous samples. The well was extremely turbid on the date of sampling. The initial turbidity measured at the start of purging was >1000 NTU (see purge data sheet in laboratory report in Appendix D). At the time of sampling the measured turbidity was 13.50 NTU. For comparison, the highest sampling turbidity in the other wells was 3.98. In the March 1999 sampling event the initial turbidity in MW-14 was 4.39 and the turbidity at the time of sampling was 2.34. Based on the turbidity data, the anomalously high lead concentration in MW-14 was attributed to suspended particulate matter and is considered to be spurious.

This conclusion was discussed with the lab manager. Laboratory testing of the filtered sample collected for dissolved ferrous iron analysis found only 3.5 ug/l lead, confirming that the original analysis reflected suspended material. The analytical report for the filtered sample is included in Appendix D.

3.3 Groundwater Elevation and Flow

Prior to purging any of the wells, static groundwater levels were measured in all of the monitoring wells including those not scheduled to be sampled. Static groundwater levels were used to calculate groundwater elevations for each well location. Shallow and deep groundwater elevation maps for the August sampling event are provided in Figures 10 and 11 respectively.

As the maps illustrate, shallow groundwater flow is consistent with that observed in previous events. The highest observed elevation continues to be found at MW-9. Flow is predominantly to the west and southwest.

No static water level measurements were made in the deep wells MW-2DR and MW-7D. The area around MW-2DR was flooded. When the surface water was cleared away and the manhole was opened, water was observed entering the protective casing from below grade. In order to prevent water from entering the well itself, the locking cap, was not removed and no measurement could be made. The protective steel casing of MW-7D had been struck by a vehicle and crimped, rendering it unopenable. The calculated groundwater elevations in the remaining deep wells, MW-4D and MW-8D, were consistent with those previously observed.

Rather than incur the expense of well repair, KSRC recommends that MW-7D be sealed and abandoned. In addition, because no further groundwater sampling is proposed for any of the deep wells, all of the remaining deep wells (MW-2DR, MW-4D, and MW-8D) will also be sealed and abandoned.

4.0 PROPOSED REMEDIAL ACTION

Post-remedial groundwater monitoring revealed that some contaminants were present at concentrations exceeding the GWQC after the completion of site capping. The RVR proposed no further action because groundwater quality was generally improving sitewide, and because no groundwater exposure route exists. Furthermore, the site is surrounded by contaminated properties and is known to be in an area of widespread groundwater contamination. The Department responded (letter dated Dec. 8, 1998) by requiring the preparation of an RAW geared toward the use of monitored natural attenuation (MNA) in accordance with NJAC 7:26E-6.3(d). KSRC was also required to establish a CEA for those groundwater contaminants "which result from KSRC activities".

4.1 Contaminants of Concern

Tables 1 and 2 provide analytical data summaries for the two most recent groundwater sampling events, March 8-10, 1999 and August 16-17, 2000 respectively. Figures 8 through 11 provide shallow and deep groundwater elevation maps for the March 1999 and August 2000 sampling events.

The groundwater contaminants which have been identified at concentrations exceeding the GWQC in the most recent sampling events are:

Phenanthrene (MW-13)
Arsenic (MW-2DR, MW-4D, MW-5, MW-10)
Cadmium (MW-2SR, MW-7S, MW-9, MW-13)
Lead (MW-9, MW-10, MW-11, MW-13,)
Nickel (MW-5, MW-10)
Zinc (MW-9, MW-13)

The sources of these contaminants have been discussed in previous documents but for discussion purposes are reviewed below. This discussion includes additional new information obtained through NJDEP file reviews. Of the six groundwater contaminants, only cadmium, lead, and zinc are used by KSRC. However, each of these three metals is also known to be present in groundwater at concentrations exceeding the GWQC upgradient of KSRC.

Phenanthrene: Elevated concentrations of phenanthrene were found only in well MW-13; the compound was not detected in the nearest downgradient wells. Phenanthrene is a common constituent of coal ash which is present in the older fill throughout the study area Phenanthrene is also present at high concentrations in the Kearny 1 leachate. The presence of phenanthrene in the sample from MW-13 is attributed to coal ash and cinder in the fill material found at the well location (RVR p. 22). This represents historic fill material and is unrelated to KSRC activities. Therefore, phenanthrene is not addressed in the RAW or CEA.

Arsenic: KSRC specifically excludes the use of arsenic or arsenic alloys in their process. Trace levels of arsenic (typically measuring <0.02%) are present in some of the feedstocks employed. Such low concentrations are derived from arsenic minerals which occur in natural association with copper ores and are found dissolved in refined coppers and copper alloys. The concentration of copper is from 2900 to 4200 times greater than that of arsenic in the materials used and produced by KSRC. These values are three orders of magnitude greater than those found in any of the groundwater or soil samples collected at KSRC. This is an indication that KSRC materials are not the source of the arsenic in the groundwater.

The historic evaluation shows that arsenic is derived in part from numerous upgradient, off-site sources, including the A1 Dump, The Kearny 1 Landfill, the Central Salvage site, the Campbell Foundry site, and the Kearny 2 Landfill. In addition, older industrial fill and materials associated with the operations of Woburn Chemical immediately to the east of KSRC are also probable sources of arsenic. An additional historical on-site source of arsenic is attributed to the use of "Paris Green" (copper acetoarsenate: $(CuO)_3As_2O_3$ - $Cu(Cu_2H_3O_2)_2$) by the HCMEC. Chemical evidence supports the conclusion that some of the arsenic is derived from Paris Green rather than materials used by KSRC. The concentrations of copper in Paris Green is 3.39 times greater than that of arsenic. The concentrations of copper in the recent groundwater samples collected from MW-5 and MW-9 are 3.18 and 6.7 times greater than those of arsenic respectively. These values are similar to the those of Paris Green and do not even approach the high values associated with the materials used and produced by KSRC.

Based on the foregoing, the arsenic in the groundwater is not related to KSRC activities, and is therefore not addressed in the RAW or CEA.

<u>Cadmium:</u> Cadmium contaminated groundwater flows onto the site from a number of upgradient source areas including the A1 Dump, the Campbell Foundry site, the Newark-Jersey City Turnpike site, and the Kearny 2 Landfill. However, because cadmium is also present in the materials used and produced by KSRC, some of the groundwater cadmium may be attributable on-site sources related to KSRC. Therefore, cadmium is addressed in both the RAW and the CEA.

<u>Lead:</u> Lead contaminated groundwater flows onto the site from upgradient source areas including the A1 Dump, The Kearny 1 Landfill, the Central Salvage site, the Campbell Foundry site, and the Kearny 2 Landfill. However, lead is also present in the materials used and produced by KSRC, and is addressed in both the RAW and the CEA.

<u>Nickel:</u> Nickel contaminated groundwater flows onto the site from upgradient source areas including the A1 Dump, The Kearny 1 Landfill, the Campbell Foundry site, and the Kearny 2 Landfill. In addition, light bulb manufacturing waste buried in the vicinity of MW-5 and MW-10 was identified as an on-site, historical source of nickel unrelated to KSRC activities (see Section 2.1). However, there is no on-site source related to KSRC activities. Therefore, nickel is not addressed in the RAW or CEA.

<u>Zinc:</u> Zinc contaminated groundwater flows onto the site from upgradient source areas including the A1 Dump, The Kearny 1 Landfill, the Campbell Foundry site, and the Kearny 2 Landfill. However, zinc is also present in the materials used and produced by KSRC, and is addressed in both the RAW and the CEA.

Of the contaminants exceeding the GWQC, only cadmium, lead, and zinc were used by KSRC. Therefore, KSRC activities cannot be excluded for making some contribution the metals in groundwater. However, any contaminant mass derived from KSRC activities is much less than that derived from the upgradient off-site sources. The remaining groundwater contaminants are the result of regional groundwater degradation originating off-site, and/or historical on-site conditions unrelated to KSRC activities. Therefore, the RAW and the CEA addresses only cadmium, lead, and zinc.

4.2 Justification of Remediation by Monitored Natural Attenuation

The remedial action selected for cadmium, lead, and zinc the on-site groundwater is monitored natural attenuation (MNA). In the August 2000 samples, all three of these metals occurred at concentrations exceeding the GWQC in monitoring wells MW-9 and MW-13. In addition, the concentration of cadmium exceeded the GWQC in MW-2 and MW-7S, and the concentration of lead exceeded the GWQC in MW-10, MW-11, and MW-13. The Department's December 8, 1998 letter specified that KSRC provide the following information with regard to the effectiveness of MNA at the site:

1). evidence to support its viability under site specific conditions; and,

2). the mechanisms by which it is occurring.

Based on the March 1999 groundwater samples, it was concluded that natural attenuation is effectively limiting the migration of these contaminants in the groundwater and reducing the extent of the on-site plume. The concentrations of cadmium, lead, and zinc, which exceed the GWQC in MW-9 and MW-13 did not exceed them in the downgradient wells (MW-14, MW-12, MW-3R, MW-5, MW-10, and MW-11) at that time. In some of the pre-remediation groundwater samples these metals did exceed the GWQC in some of the downgradient wells. As noted in the RVR, a general decrease in groundwater contaminant concentrations was observed in the post-remedial monitoring samples. The general decrease in the concentrations of cadmium, lead, and zinc and the decrease in the extent of their plumes were interpreted as positive indicators of the effectiveness of NA at this site.

In the August 2000 samples, contaminant concentrations increased generally and a corresponding increase in contaminant plume size was observed. In the case of wells MW-7S, MW-10, MW-11, and MW-14, the wells are in downgradient locations and there are no wells further downgradient to delineate the plumes.

Attenuation rates for cadmium, lead, and zinc were calculated based on the March 1999 and August 2000 groundwater sample results. The rates were determined by comparing upgradient and downgradient wells and simply dividing the decrease in contaminant concentration by the distance between wells. Calculations are provided in Appendix E. Metal concentrations were compared between the following five pairs of wells, which are located approximately parallel to the direction of groundwater flow (see Figures 10 & 12). Thus, the following five sets of calculations were made for each of the three metals of concern:

1. MW-9 to MW-10
2. MW-9 to MW-11
3. MW-13 to MW-14
4. MW-13 to MW-5
5. MW-13 to MW-7S

The calculated attenuation rates for the March 1999 samples are as follows:

Metal	Range of Calculated Attenuation Rates
Cd	0.06 - 0.66 ug/l/ft
Pb	0.03 - 0.9 ug/l/ft
Zn	18.7 - 44.0 ug/l/ft

The calculated attenuation rates for the August 2000 samples are as follows:

Metal	Range of Calculated Attenuation Rates
Cd	0.08 - 0.94 ug/l/ft
Pb	0.06 - 0.29 ug/l/ft
Zn	24.5 - 56.0 ug/l/ft

The calculated attenuation rates are based on the assumption that contaminant concentrations vary linearly with distance. The variations observed between the calculated attenuation rates can be attributed to variations in local conditions arising from fill heterogeneity. Another possible reason for the observed variations is that the actual rate of attenuation may vary as a function of contaminant concentration. At higher concentrations, dissolved metals are closer to their saturation points in solution. Therefore, precipitation requires smaller changes in physical and chemical conditions at higher concentrations than at lower concentrations. Accordingly, attenuation rates are expected to decrease as concentrations decrease. However, the fact that the concentrations in the downgradient wells used in the calculations are lower than in the upgradient wells indicates that the calculated attenuation rates are a reasonable approximation of the actual site conditions and can be used to make predictions concerning groundwater contaminant migration.

The calculated attenuation rates for cadmium were used to predict the extent of the plume downgradient of MW-2SR. In the March 1999 sample, cadmium was found in MW-2SR at a concentration of 10.6 ug/l. Using the lowest of the calculated attenuation rates for cadmium (0.06 ug/l/ft) it was determined that cadmium concentrations would be reduced to the GWQC (4.0 ug/l) within a distance of 110 feet downgradient of MW-2SR. Based on the August 2000 concentration (21 ug/l) and lowest calculated attenuation rate (0.09 ug/l/ft) it was determined that cadmium concentrations would be reduced the GWQC within a distance of 188 feet downgradient of MW-2SR. The nearest downgradient property line is 260 feet from MW-2SR. Therefore, it is concluded that cadmium is not migrating off-site downgradient of MW-2SR. This conclusion is corroborated by historic groundwater samples which were collected from the original MW-1 which was located downgradient of the MW-2SR location.

Similarly, the August 2000 concentrations and calculated attenuation rates were used to determine the extent of the lead plume downgradient of MW-10 and MW-11, and the cadmium plume downgradient of MW-7S. The calculated distances at which the lead plume reaches the GWQC are 38 feet downgradient of MW-10 and 25 feet downgradient of MW-11. In both cases, the leading edge of the plume is more than 100 feet from the nearest downgradient property line. The calculated distance at which the cadmium plume reaches the GWQC downgradient of MW-7S is 14 feet. Again, the leading edge of the plume is more than 150 feet from the nearest downgradient property line. Based on these calculations, there is no off-site migration of cadmium or lead.

In the March 1999 and August 2000 sampling events, geochemical analyses were conducted in addition to metals analyses. The geochemical parameters analyzed were dissolved ferrous iron, alkalinity, sulfate, pH, conductivity, dissolved oxygen, and redox potential. The results of these analyses are summarized on Tables 2 and 3. In many of the analyses, the values of these parameters indicate favorable conditions for effective natural attenuation. While the ranges of the values are indicative of the heterogeneity of the fill materials found on the site, the fact that contaminants are not migrating off-site demonstrates that overall site conditions are conducive to the effective natural attenuation of cadmium, lead, and zinc.

The sample pH values generally mirror the attenuation scenario outlined in Section 2.3 above. Samples from wells MW-8D, MW-9, and MW-10, all in upgradient locations, were among of the most acidic encountered on-site. The easternmost wells on-site, MW-2SR and MW-2DR, are among the most alkaline. This is the anticipated condition based on the migration of acidic leachate and/or groundwater originating the from landfills east of KSRC.

5.0 PROPOSED CLASSIFICATION EXCEPTION AREA

The proposed Classification Exception Area (CEA) is defined horizontally by the property boundary, and vertically by the Pleistocene glacio-fluvial deposits underlying the site. Figure 12 is a map of the CEA. A CEA Fact Sheet and Documentation are provided in Appendix F. Although the CEA boundaries are defined as the property boundary, the CEA map illustrates the interpolated GWQC concentration isopleth for each of the metals of concern based on the calculated attenuation rates discussed above. The anticipated GWQC isopleths for all three metal are well within the property boundary. Therefore, setting the CEA boundary at the property line is the most conservative approach, providing a protective buffer zone between the area of contamination and off-site properties.

Groundwater monitoring is proposed to evaluate the effectiveness of NA and to insure that there is no off-site migration of contaminants. A sufficient number of existing "clean" wells are present downgradient of MW-9 and MW-13 to serve as effective "sentinel" wells for plume monitoring. Accordingly, annual monitoring can be reduced from all 18 wells to the following 10: MW-9, MW-13, and the downgradient wells MW-2SR, MW-4S, MW-5, MW-7S, MW-10, MW-11, MW-12, and MW-14.

In the March 1999 sample, MW-2SR contained cadmium at a concentration exceeding the GWQC. Because the original MW-1 and MW-3 were abandoned, there is currently no well downgradient of MW-2SR. However, based on the most conservative of the calculated attenuation rates for cadmium, it was determined that the concentration would be reduced to the GWQC within a distance of 188 feet downgradient of MW-2SR, which is 72 feet from the property boundary. Based on the concentrations historically found at KSRC, it is unlikely that cadmium will ever exceed the GWQC at the property boundary. Therefore, MW-2SR alone will be used to monitor groundwater cadmium at this location. In the unlikely event that cadmium concentrations in MW-2SR show an increasing trend in the future, the need for additional monitoring wells will be re-evaluated.

Annual groundwater sampling will be conducted in accordance with NJDEP sampling guidance. Annual monitoring will be conducted in March of each year. Groundwater samples will be collected using "low-flow" purging and sampling methodologies. All samples will be analyzed for priority pollutant metals and the geochemical parameters dissolved ferrous iron, alkalinity, sulfate, pH, conductivity, dissolved oxygen, and redox potential. Static water levels will be measured in all wells, including those not being sampled, and groundwater elevation maps will be prepared for each sampling event. Because annual monitoring is proposed, there is no longer any need for the preparation of quarterly progress reports. Accordingly, only annual reports of groundwater monitoring results will be prepared. These reports will be submitted within thirty days of receiving the results of the groundwater sample analyses.

The temporal duration of this CEA is indeterminate. It is not currently possible to determine the time necessary to reduce the sitewide groundwater concentrations of the metals of concern to below the GWQC. This is due primarily to the fact that contaminated groundwater continues to migrate onto the site from uncontrolled upgradient sites. Until such time as these sites are fully evaluated and put under hydraulic control, the migration of contaminated groundwater onto the KRSC site will continue.

6.0 DISCUSSION AND CONCLUSIONS

The regional history, the nature of the contaminated sites located upgradient of KSRC, and the results of on-site measurements confirm and justify the conclusion that contaminated groundwater is migrating onto the site from upgradient sources. In addition, historical on-site sources of groundwater contamination which are unrelated to KSRC operations have been identified and confirmed. On the basis of these evaluations and research, the groundwater contaminants which may in part be attributed to KSRC are the metals cadmium, lead, and zinc.

Groundwater monitoring after the completion of site capping has shown a general decrease in the concentrations of cadmium, lead, and zinc sitewide. This confirms the effectiveness of the remedial actions undertaken. However, the groundwater concentrations of cadmium, lead, and zinc continue to exceed the GWQC in several wells. The exceedances are attributed to contaminants migrating from off-site sources. Monitoring results indicate that groundwater contaminants identified in wells MW-9 and MW -13 are not migrating off-site. Cadmium found in the samples from MW-2SR has been evaluated using attenuation rates calculated from existing on-site data. Based on these values it has been determined that there is no off-site migration of this contaminant.

MNA is proposed as the remedial action to address this contamination. Geochemical conditions and parameters conducive to natural attenuation have been identified through sampling and analysis. However, the empirical evidence of actual on-site reduction of contaminant concentrations to below the GWQC is the most conclusive evidence for the effectiveness of MNA at this site.

Groundwater monitoring will be conducted in selected shallow wells to evaluate the continued effectiveness of MNA and to insure that no off-site migration of contaminants occurs. Ten of the existing wells will be sampled for metals using "low-flow" purging and sampling techniques on an annual basis. The four existing deep monitoring wells will be sealed and abandoned.

Because groundwater contaminant concentrations exceed the GWQC a groundwater CEA is proposed. The horizontal limits of the proposed CEA are the site boundaries. The vertical extent of the CEA is from the site surface through the underlying Pleistocene glacio-fluvial deposits. Due to the fact that contaminated groundwater continues to enter the site from off-site sources the duration of the CEA cannot be determined at this time.

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TABLES

TABLE 1
ANALYTICAL RESULTS SUMMARY
GROUNDWATER SAMPLES: MARCH 8 - 10, 1999

PARAMETER	MW-1R	MW-2SR	MW-2DR	MW-3R	MW-4S	MW-4D	MW-5	MW-6	MW-7S	MW-7D	MW-8S	MW-8D	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	GWQC
TOTAL METALS: (ug/l)								DRY											
Antimony	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20
Arsenic	5.3	ND	**58.7**	4.9	ND	**62.1**	**31.9**		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8
Beryllium	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20
Cadmium	0.4	**10.6**	ND	ND	ND	ND	0.88		1.5	ND	2.4	ND	**12.2**	0.56	ND	ND	**81.1**	ND	4
Chromium	ND	ND	ND	ND	ND	ND	ND		ND	1.6	ND	3.6	ND	ND	ND	8.8	ND	ND	100
Copper	11.4	ND	ND	8.3	ND	4.6	141		21.4	ND	8.9	ND	269	36.6	30.1	ND	119	ND	1000
Lead	ND	ND	ND	3.2	ND	ND	2.1		ND	ND	ND	ND	**10.3**	3.5	ND	ND	**25.9**	ND	10
Mercury	ND	ND	ND	ND	ND	ND	0.18		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
Nickel	76.9	9.3	1.7	22.3	2.7	2.2	**396**		4.5	ND	4.5	ND	49	87.9	ND	4.9	25.4	ND	100
Selenium	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	34.6	ND	50
Silver	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
Thallium	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Zinc	845	1580	6.7	281	47.7	62.8	743		103	ND	307	8.4	**8520**	580	57.5	28	4270	8.8	5000
DIS. METALS: (ug/l)																			
Antimony	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20
Arsenic	ND	3.8	**60.4**	4.7	ND	**59.1**	**28.9**		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8
Beryllium	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20
Cadmium	ND	**11.2**	ND	ND	ND	ND	0.76		1.3	ND	1.3	ND	**12.7**	0.61	ND	ND	**79.8**	ND	4
Chromium	ND	ND	ND	ND	ND	ND	ND		ND	1.6	ND	2.9	ND	ND	ND	ND	ND	ND	100
Copper	ND	ND	ND	ND	ND	ND	136		12.7	ND	5.5	ND	270	27.9	27.5	ND	98.1	ND	1000
Lead	ND	ND	ND	ND	ND	ND	2.2		ND	ND	ND	ND	7.8	ND	ND	ND	**11.2**	ND	10
Mercury	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
Nickel	76.7	9.3	ND	22.2	3.8	2.3	**393**		4.8	ND	5.6	ND	51.4	85.5	1.6	ND	25.7	ND	100
Selenium	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	35.8	ND	50
Silver	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
Thallium	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Zinc	726	1600	ND	282	47	57.9	751		86.6	ND	266	6.8	**9020**	568	53.2	ND	4210	ND	5000
DIS. FERROUS IRON (ug/l)	4700	53.6	26700	13800	6300	38800	ND		1130	1320	102	6040	ND	5250	ND	ND	ND	1850	
ALKALINITY (mg/l)	322	301	527	350	367	605	461		342	301	104	271	318	517	279	109	166	96.4	
SULFATE (mg/l)	282	105	7.6	31.5	ND	ND	121		62.3	ND	54.8	ND	204	157	45.4	51	91.9	21	
pH	6.89	7.29	7.22	7.36	6.75	6.83	7.03		6.92	7.08	7.26	6.56	6.78	6.76	7.08	7.89	6.53	7.48	
CONDUCTIVITY (umhos)	750	637	944	598	532	812	870		747	829	506	866	724	952	537	525	546	262	
DIS. OXYGEN (mg/l)	0.36	0.23	0.23	0.26	0.86	0.31	0.52		3.19	0.28	0.39	0.37	1.68	0.8	5.3	0.22	0.54	0.34	
Redox Potential (mV)	-30.7	7.2	-132.1	-161.9	-58.2	-142.9	191.6		64.1	-264	163.1	-24.7	223.5	22	173.5	-252	192.1	-188.9	

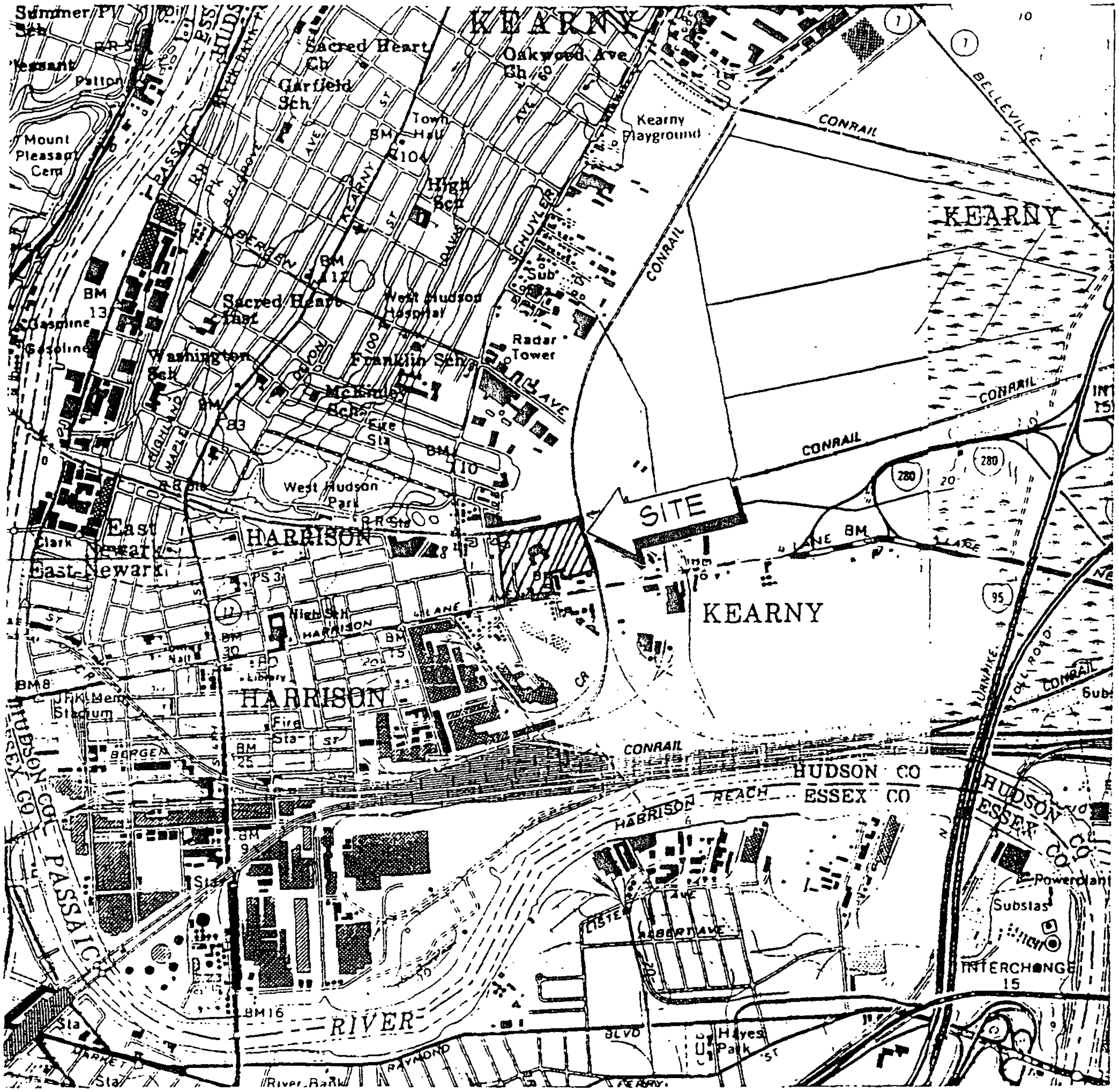
NOTES: GWQC = higher of NJDEP Groundwater Quality Criteria or PQL, 5/15/1995
Bolded values exceed GWQC.
ND = not detected

TABLE 2
ANALYTICAL RESULTS SUMMARY:
GROUNDWATER SAMPLES, AUGUST 16 -17, 2000

PARAMETER	MW-2SR	MW4S	MW-5	MW-7S	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	GWQC
METALS (ug/l)											
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20
Arsenic	ND	ND	**35.5**	ND	ND	**9.8**	ND	ND	ND	4.6	8
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20
Cadmuim	**21**	ND	1.1	**5.3**	**17.9**	1.1	ND	ND	**117**	2.3	4
Chromium	ND	ND	1.1	ND	ND	ND	3.1	ND	ND	3.9	100
Copper	ND	8.5	113	29	443	66	118	ND	92.6	372	1000
Lead	ND	ND	3	ND	**23.3**	**12.3**	**11.5**	ND	**34.5**	3.5	10
Mercury	ND	ND	0.81	ND	0.62	ND	ND	ND	0.15	0.14	2
Nickel	8	5.4	**360**	11.4	61.5	53.8	4.6	ND	27	9.1	100
Selenuim	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Zinc	792	107	541	151	**9870**	371	75	9.1	**6780**	751	5000
Dis. Ferrous Iron (ug/l	ND	ND	ND	0.15	ND	8.3	0.013	ND	ND	ND	
Alkalinity (mg/l)	275	433	458	453	479	587	551	551	268	173	
Sulfate (mg/l)	52.2	ND	88.7	27.9	87.2	93.5	39.7	21.4	55.4	ND	
pH	6.96	6.74	6.79	6.84	6.58	6.65	6.75	6.91	7	7.56	
Conductivity (umhos)	788	572	819	640	524	857	420	1254	488	600	
Dis. Oxygen (mg/l)	0.28	0.37	0.52	0.53	0.64	0.5	6.59	0.19	0.27	0.33	
Redox Potential (mV)	-7.2	-112.1	91.4	-78.6	147.8	-15.5	119.4	-329.6	86.8	-158.9	
T.D.S. (mg/l)	408	536	734	676	638	844	648	934	420	266	
T.S.S. (mg/l)	ND	17	ND	13	ND	15	ND	ND	ND	ND	

NOTES: GWQC = higher of NJDEP Groundwater Quality Criteria or PQL, 5/15/1995.
Bolded values exceed GWQC.
ND = not detected.

FIGURES



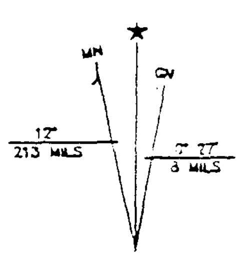
SCALE 1: 24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTUOR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



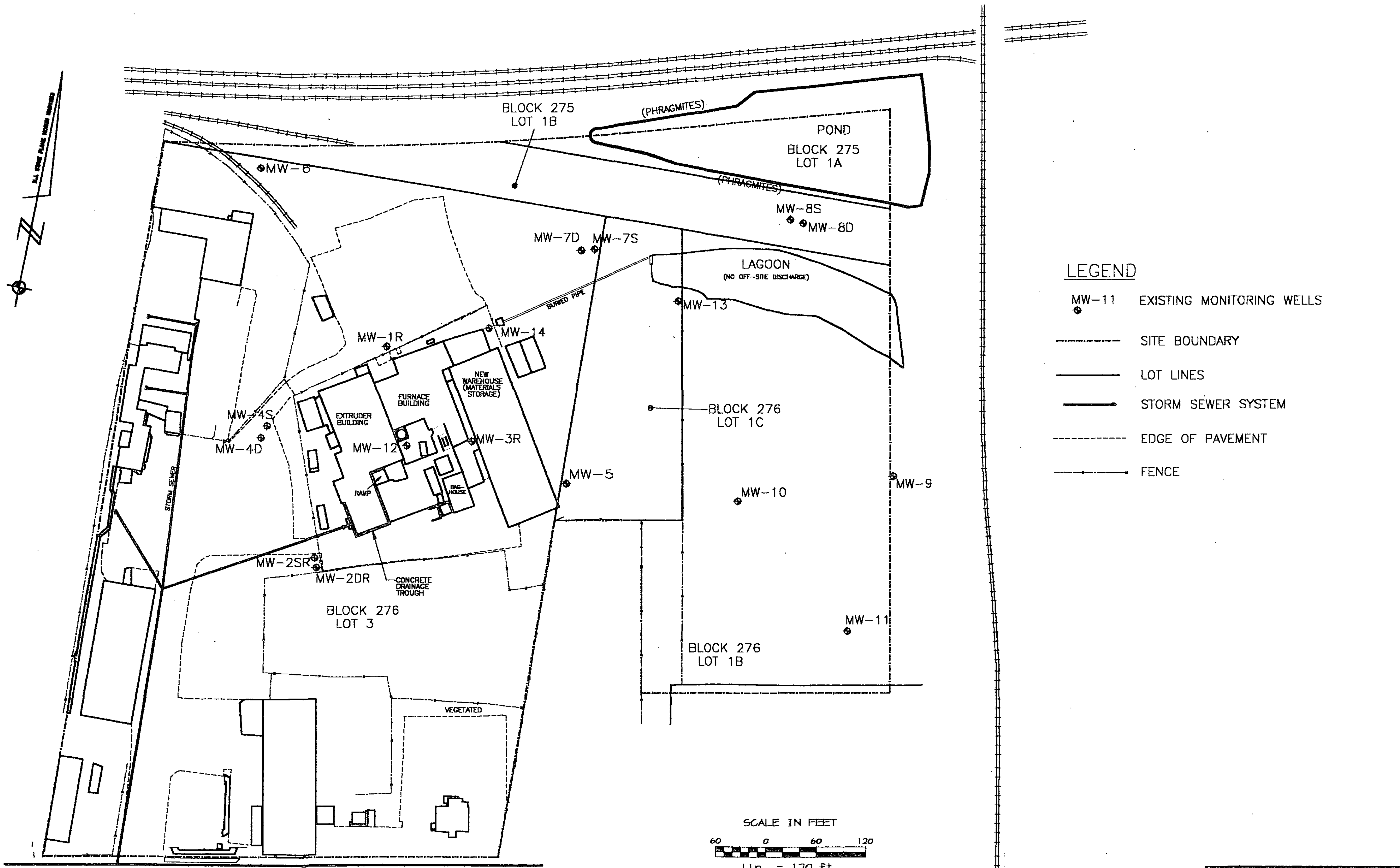
UTM GRID AND 1981 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SOURCE: U.S.G.S. WEEHAWKEN, ELIZABETH
JERSEY CITY, ORANGE
QUADRANGLES

JMZ GEOLOGY	KEARNY SMELTING

FIGURE 1:
SITE LOCATION MAP

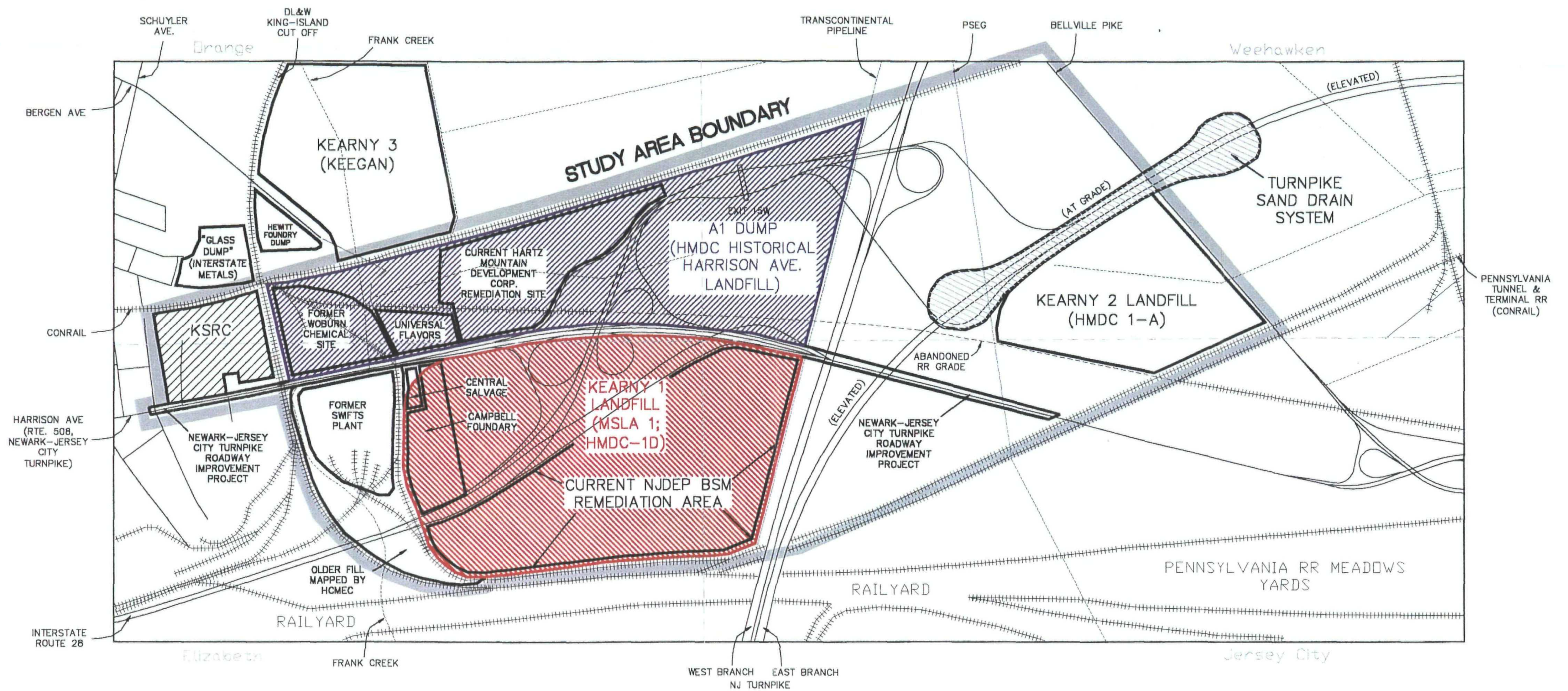
RIWP 10/95



BASE MAP BY: HENDERSON AND BODWELL, LLP, CONSULTING ENGINEERS
BOUNDARY AND TOPOGRAPHIC SURVEY OF TAX MAP LOTS 1B & 2A IN BLOCK 275
AND LOTS 1B,1C & 3 IN BLOCK 276 FOR KEARNY SMELTING AND REFINING CORP.
DWG.NO. NJ227-1050, SHEET 1 OF 1, 11/16/95

JMZ GEOLOGY	KSRC
FIGURE 2: CURRENT SITE MAP	

Rev. 9/00



LEGEND

- Interstate, State, and County Roads
- Dirt and Cinder Roads
- Railroad Tracks
- Ditches
- 7-1/2' Quadrangle Boundaries
- Approximate Limits of A1 Dump
- Approximate Limits of Kearny 1 Landfill

500 0 500 1000

1 inch = 1000 feet

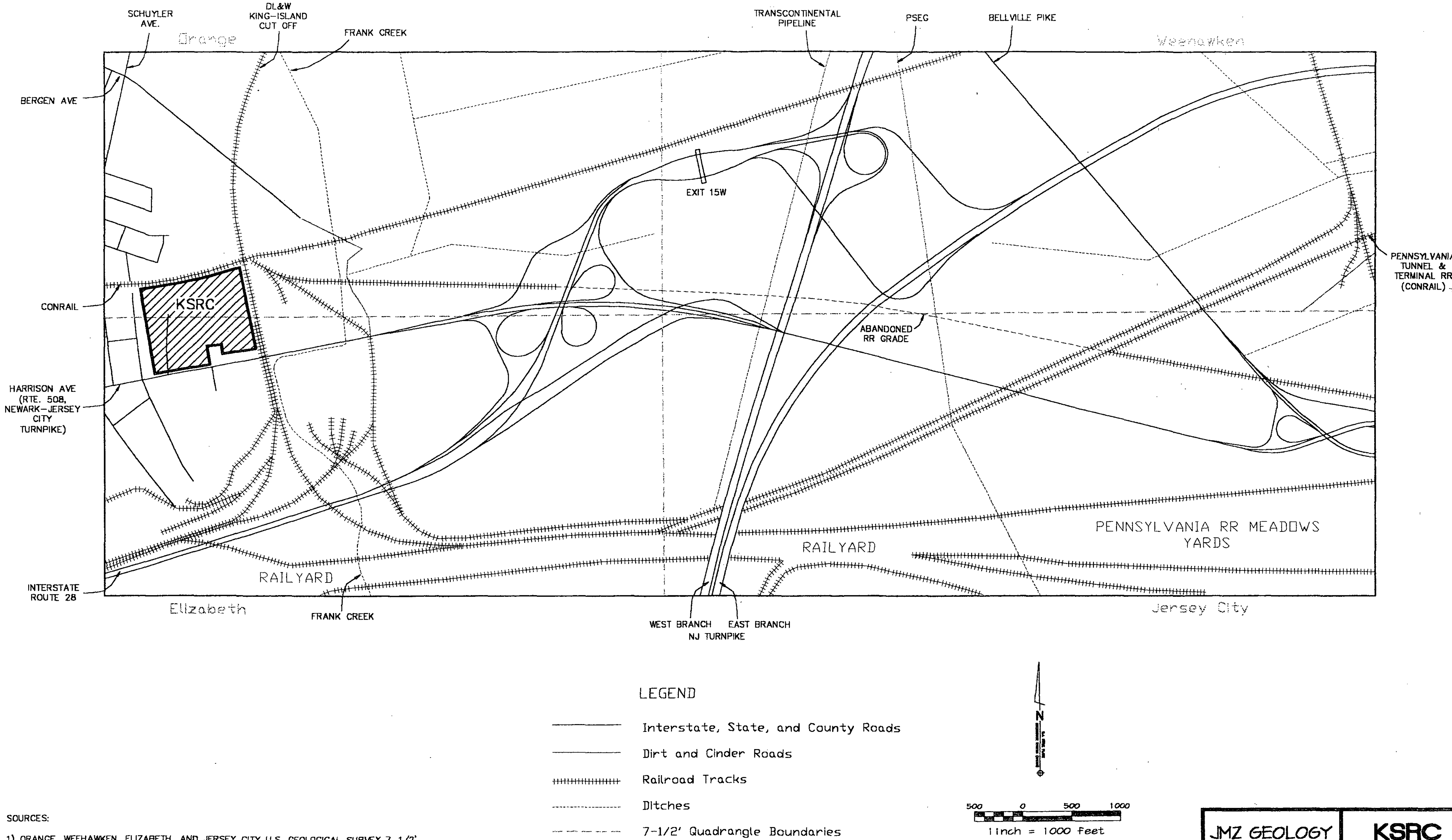
SOURCES:

1) ORANGE, WEEHAWKEN, ELIZABETH, AND JERSEY CITY U.S. GEOLOGICAL SURVEY 7-1/2' TOPOGRAPHIC QUADRANGLES

2) N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION DIGITAL ORTHOPHOTO QUARTER QUADRANGLES 414.JPG, 423.JPG, 522.JPG, AND 531.JPG

JMZ GEOLOGY	KSRC

FIGURE 3: SITES DISCUSSED IN THIS REPORT



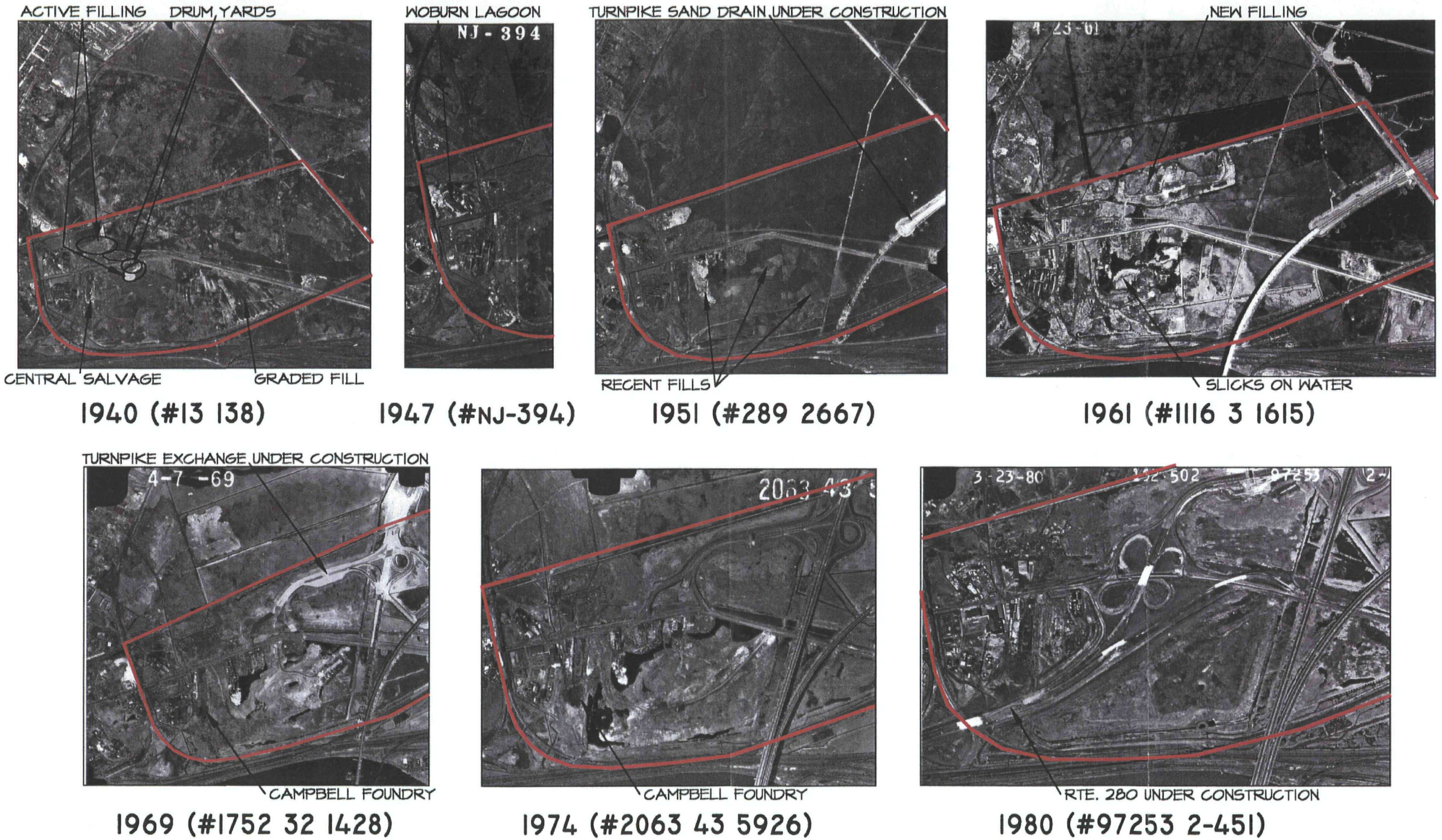
SOURCES:

1) ORANGE, WEEHAWKEN, ELIZABETH, AND JERSEY CITY U.S. GEOLOGICAL SURVEY 7-1/2' TOPOGRAPHIC QUADRANGLES

2) N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION DIGITAL ORTHOPHOTO QUARTER QUADRANGLES 414.JPG, 423.JPG, 522.JPG, AND 531.JPG

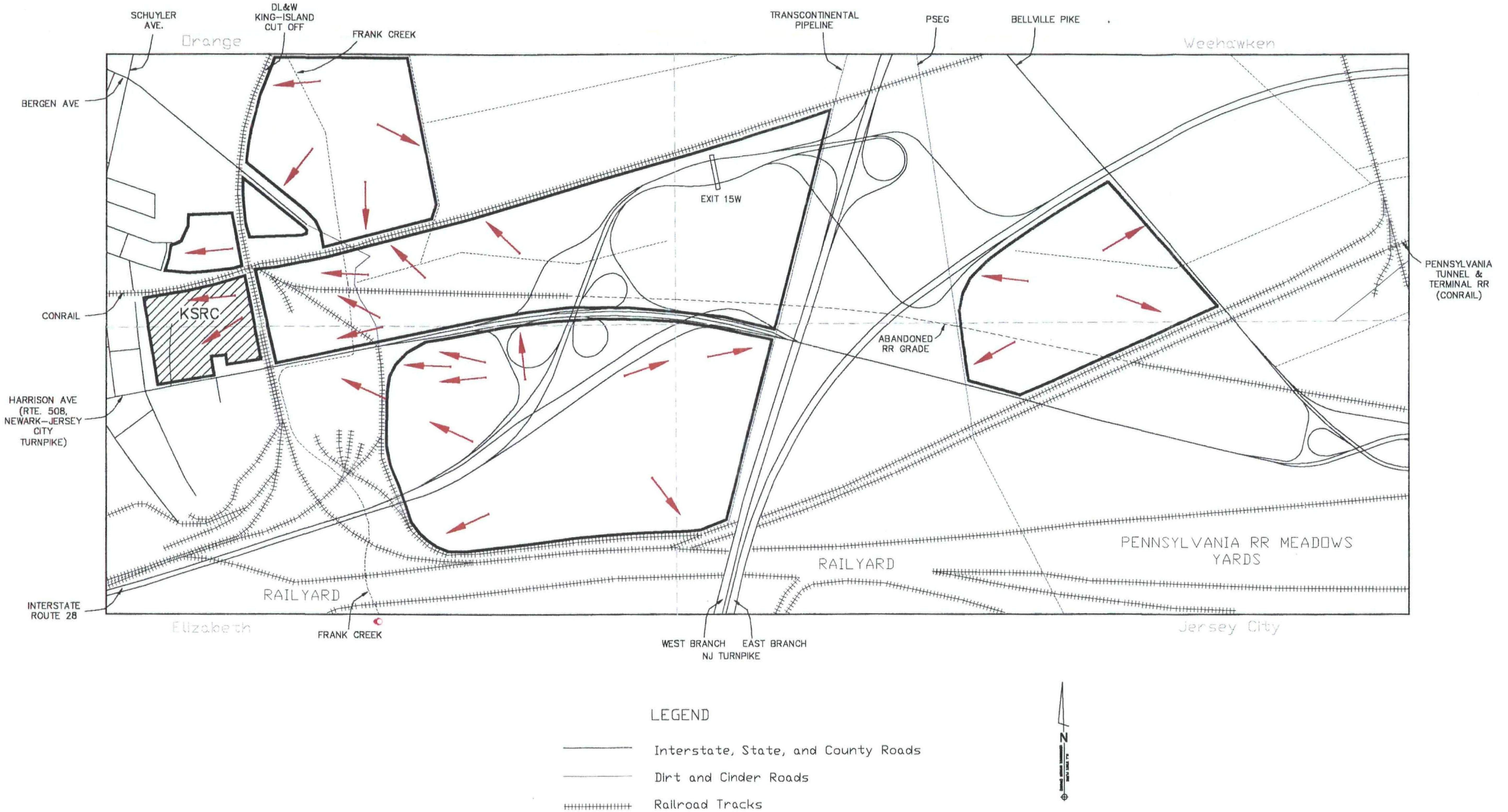
JMZ GEOLOGY	KSRC

FIGURE 4: ROADS AND PHYSICAL BOUNDARIES EAST OF SITE



Source of Photos: See References, Section 7.0 of Report
(Photos not to scale; variable scales reflect scales of original photos)

JMZ GEOLOGY	KSRC
FIGURE 5: AERIAL PHOTOS OF A1 DUMP AND KEARNY 1 LANDFILL	



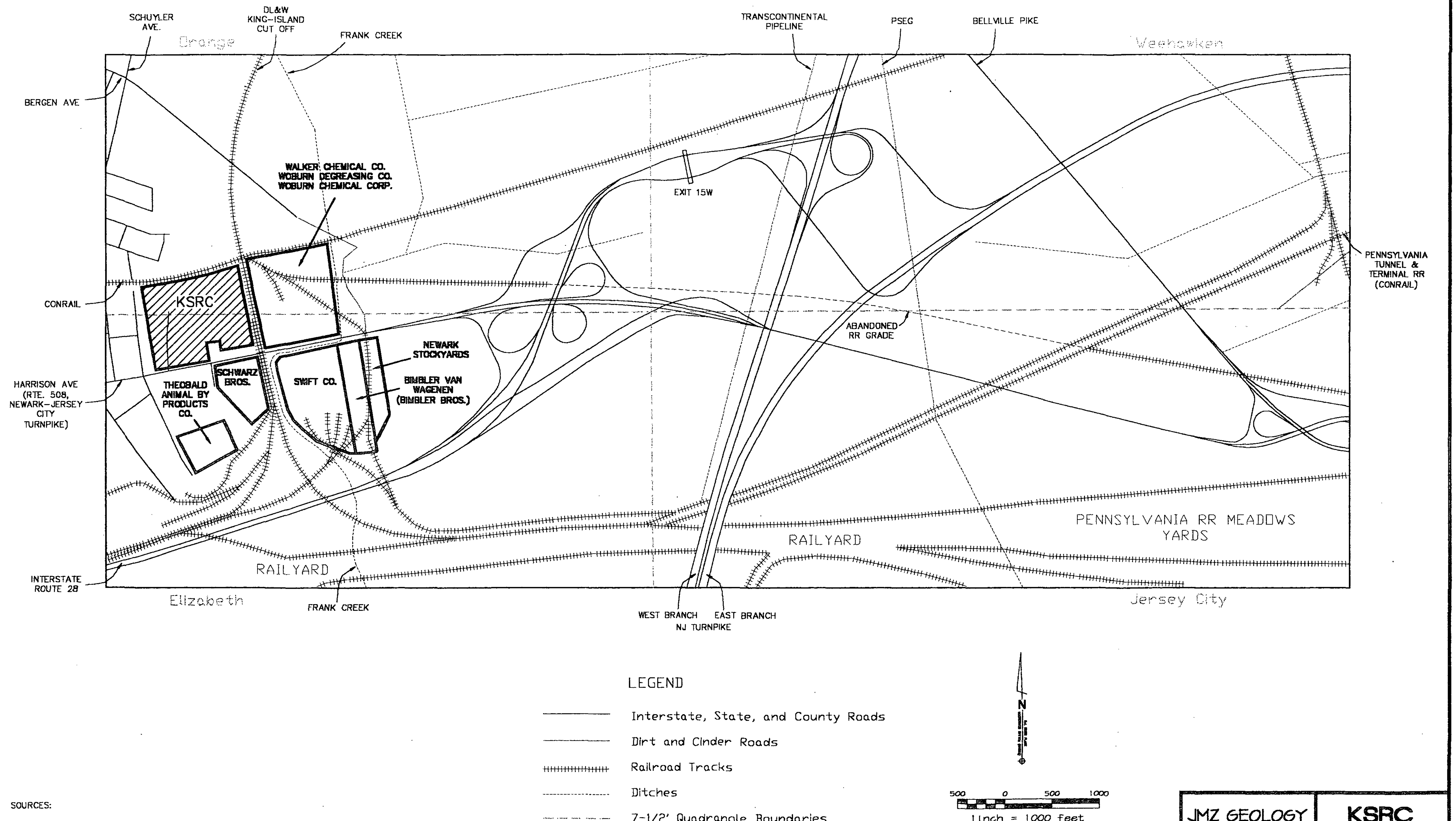
SOURCES:

1) ORANGE, WEEHAWKEN, ELIZABETH, AND JERSEY CITY U.S. GEOLOGICAL SURVEY 7-1/2' TOPOGRAPHIC QUADRANGLES

2) N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION DIGITAL ORTHOPHOTO QUARTER QUADRANGLES 414.JPG, 423.JPG, 522.JPG, AND 531.JPG

JMZ GEOLOGY	KSRC

FIGURE 6: GROUNDWATER FLOW AT UPGRADIENT SITES



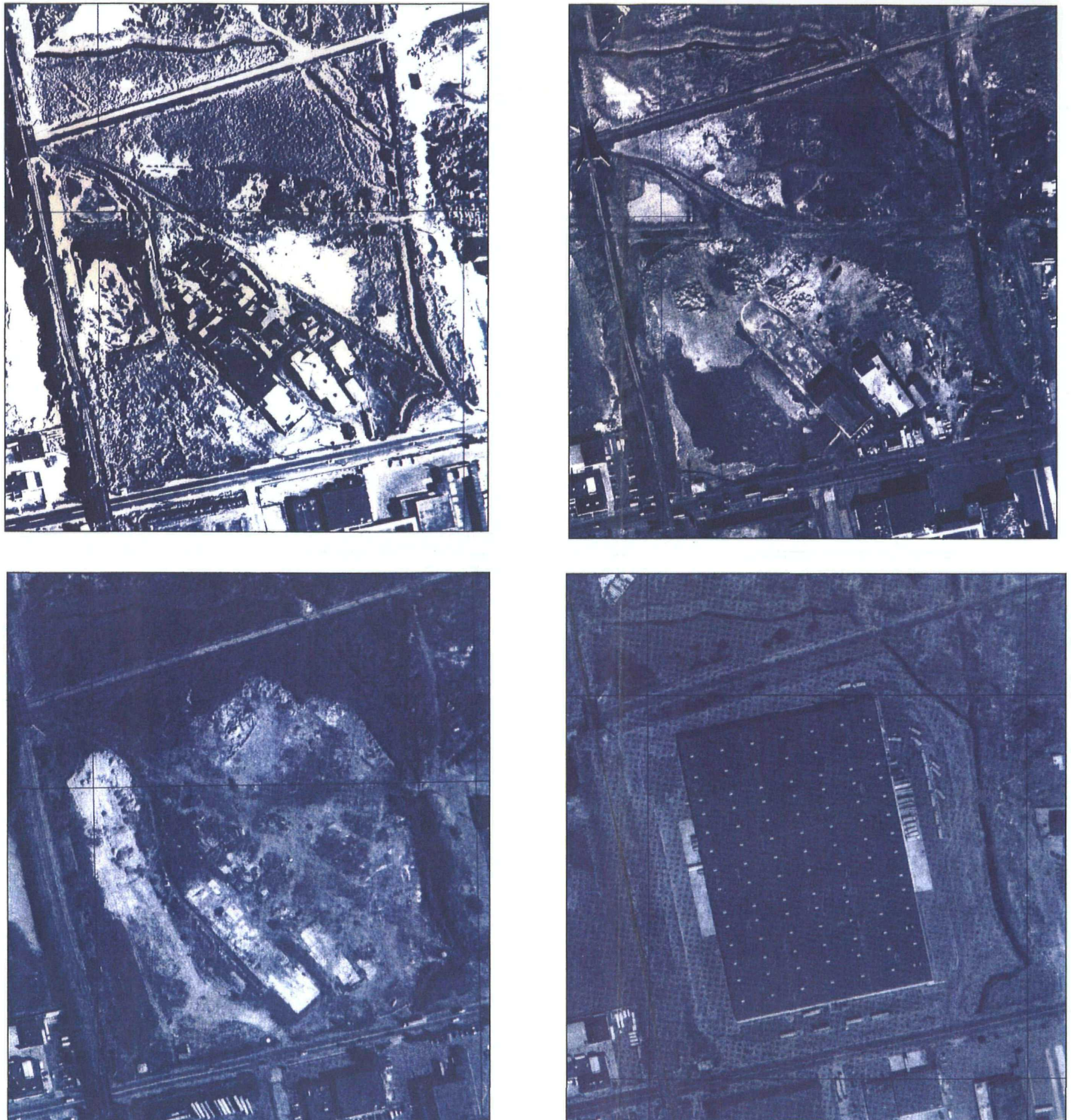
SOURCES:

1) ORANGE, WEEHAWKEN, ELIZABETH, AND JERSEY CITY U.S. GEOLOGICAL SURVEY 7-1/2' TOPOGRAPHIC QUADRANGLES

2) N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION DIGITAL ORTHOPHOTO QUARTER QUADRANGLES 414.JPG, 423.JPG, 522.JPG, AND 531.JPG

JMZ GEOLOGY	KSRC

FIGURE 7: MEAT PACKING INDUSTRIES IN THE SITE AREA



Source of Photos: State of New Jersey, Hackensack Medowlands Development Commission

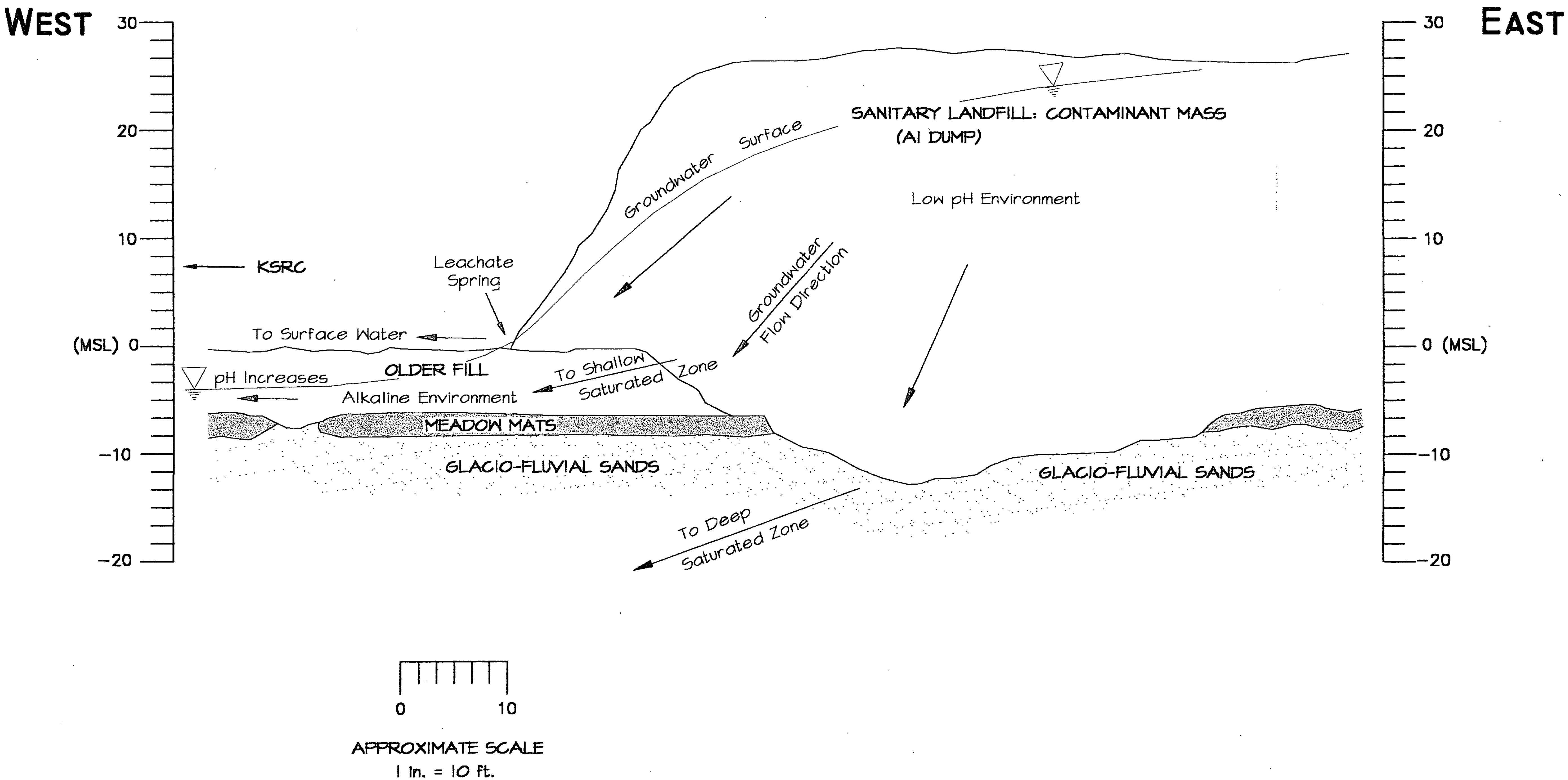
SCALE IN FEET

0 300 600

1 In. = 300 ft

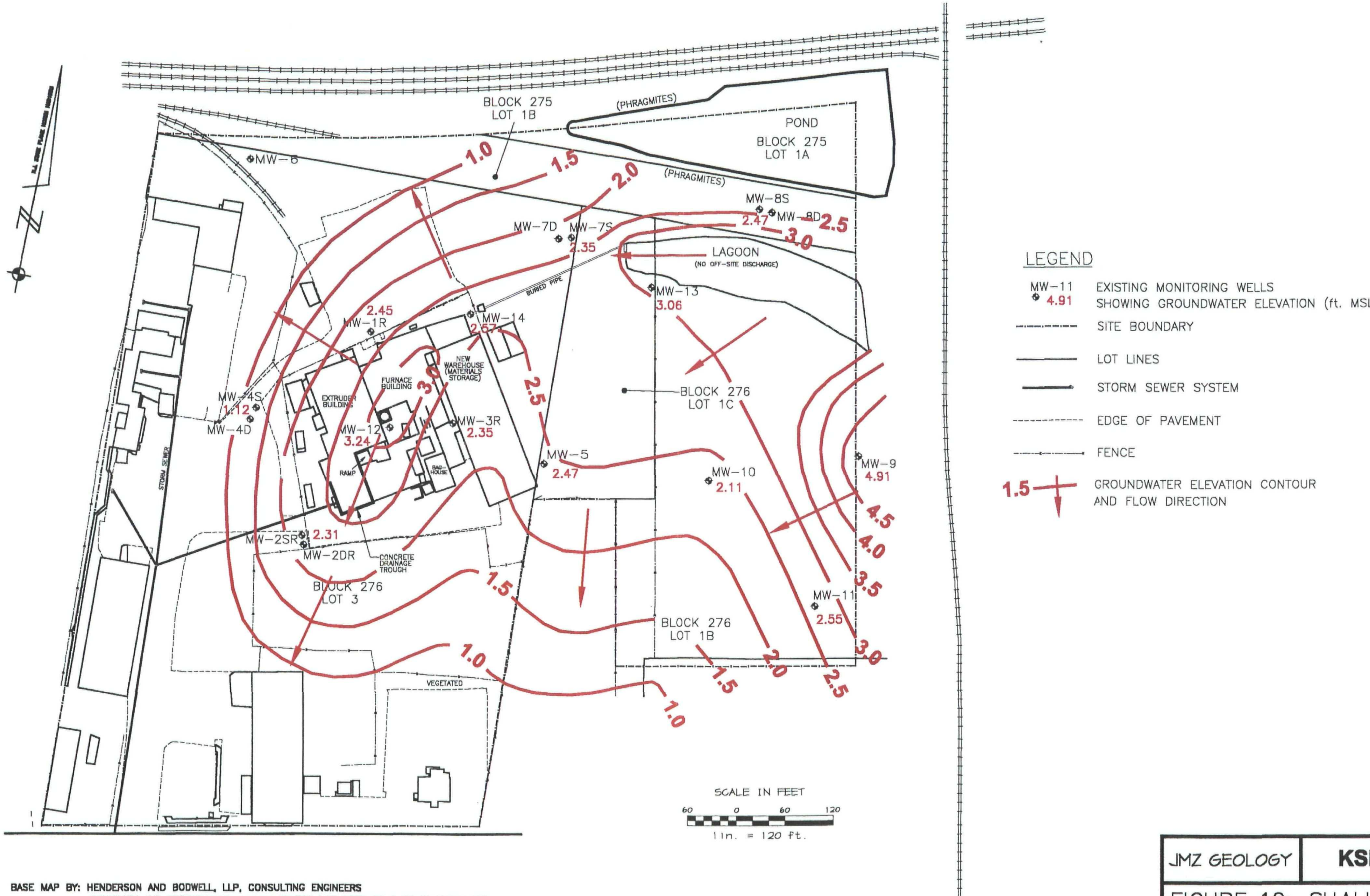
Original Photo Scale 1:12,000

JMZ GEOLOGY	KSRC
FIGURE 8: AERIAL PHOTOS OF WOBURN CHEMICAL SITE	



JMZ GEOLOGY | KSRC

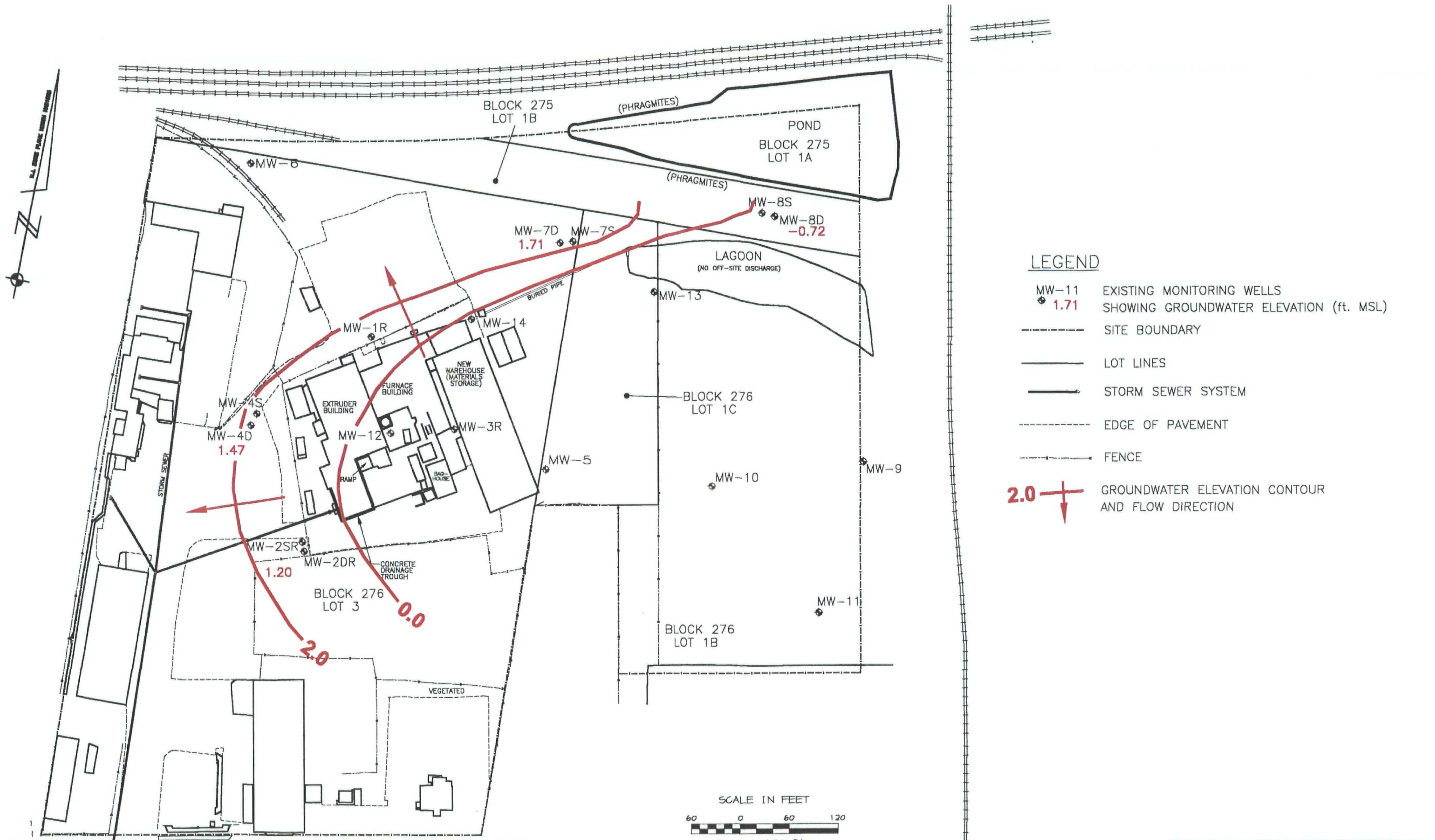
FIGURE 9: SCHEMATIC CROSS SECTION



BASE MAP BY: HENDERSON AND BODWELL, LLP, CONSULTING ENGINEERS
BOUNDARY AND TOPOGRAPHIC SURVEY OF TAX MAP LOTS 1B & 2A IN BLOCK 275
AND LOTS 1B, 1C & 3 IN BLOCK 276 FOR KEARNY SMELTING AND REFINING CORP.
DWG.NO. NJ227-1050, SHEET 1 OF 1, 11/16/95

JMZ GEOLOGY	KSRC
FIGURE 10: SHALLOW GROUNDATER ELEVATION 3/8/99	

Rev. 9/00

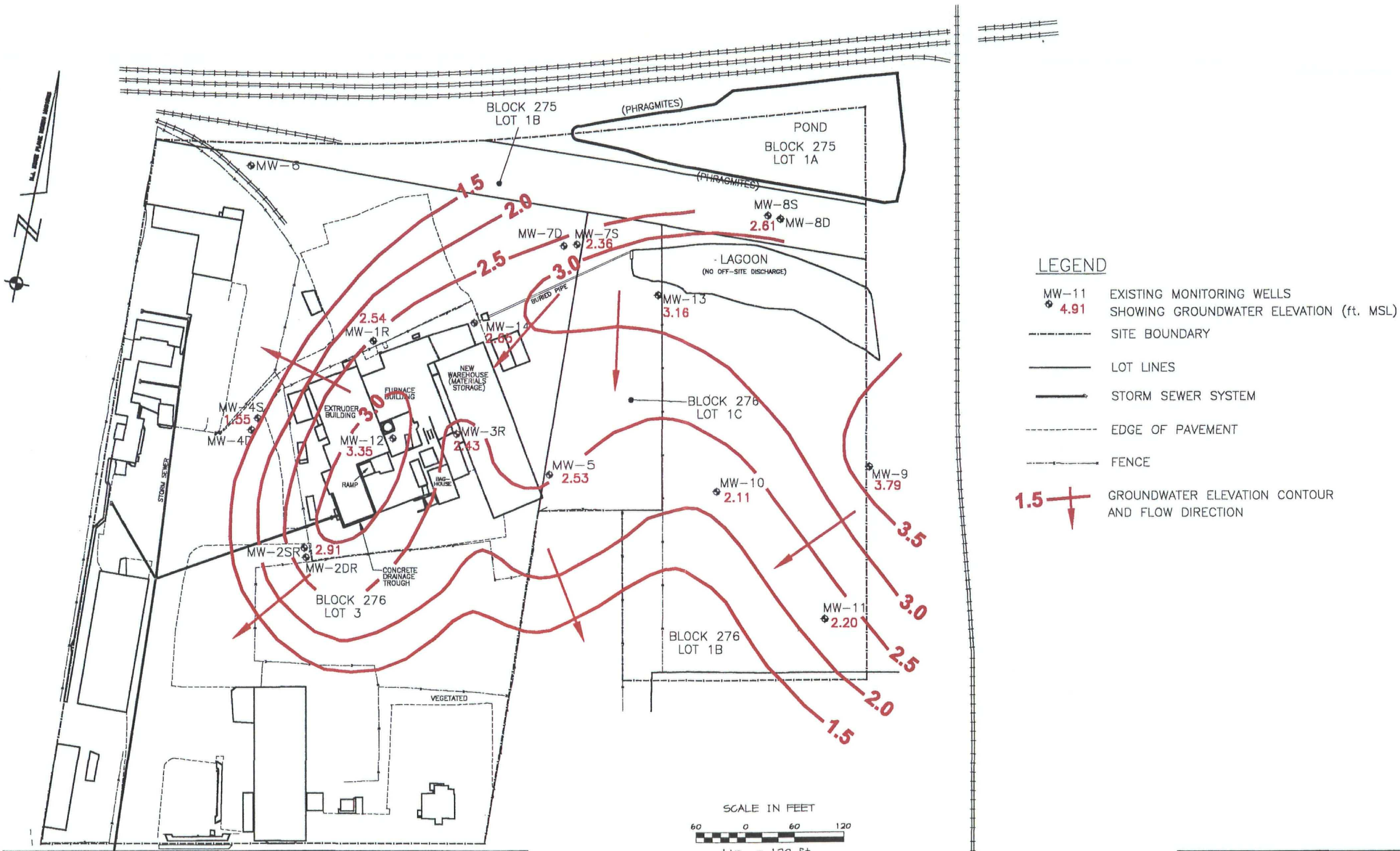


BASE MAP BY: HENDERSON AND BODWELL, LLP, CONSULTING ENGINEERS
BOUNDARY AND TOPOGRAPHIC SURVEY OF TAX MAP LOTS 1B & 2A IN BLOCK 275
AND LOTS 1B,1C & 3 IN BLOCK 276 FOR KEARNY SMELTING AND REFINING CORP.
DWG.NO. NJ227-1050, SHEET 1 OF 1, 11/16/95

JMZ GEOLOGY	KSRC

FIGURE 11: DEEP GROUNDWATER ELEVATION 3/8/1999

Rev. 9/00

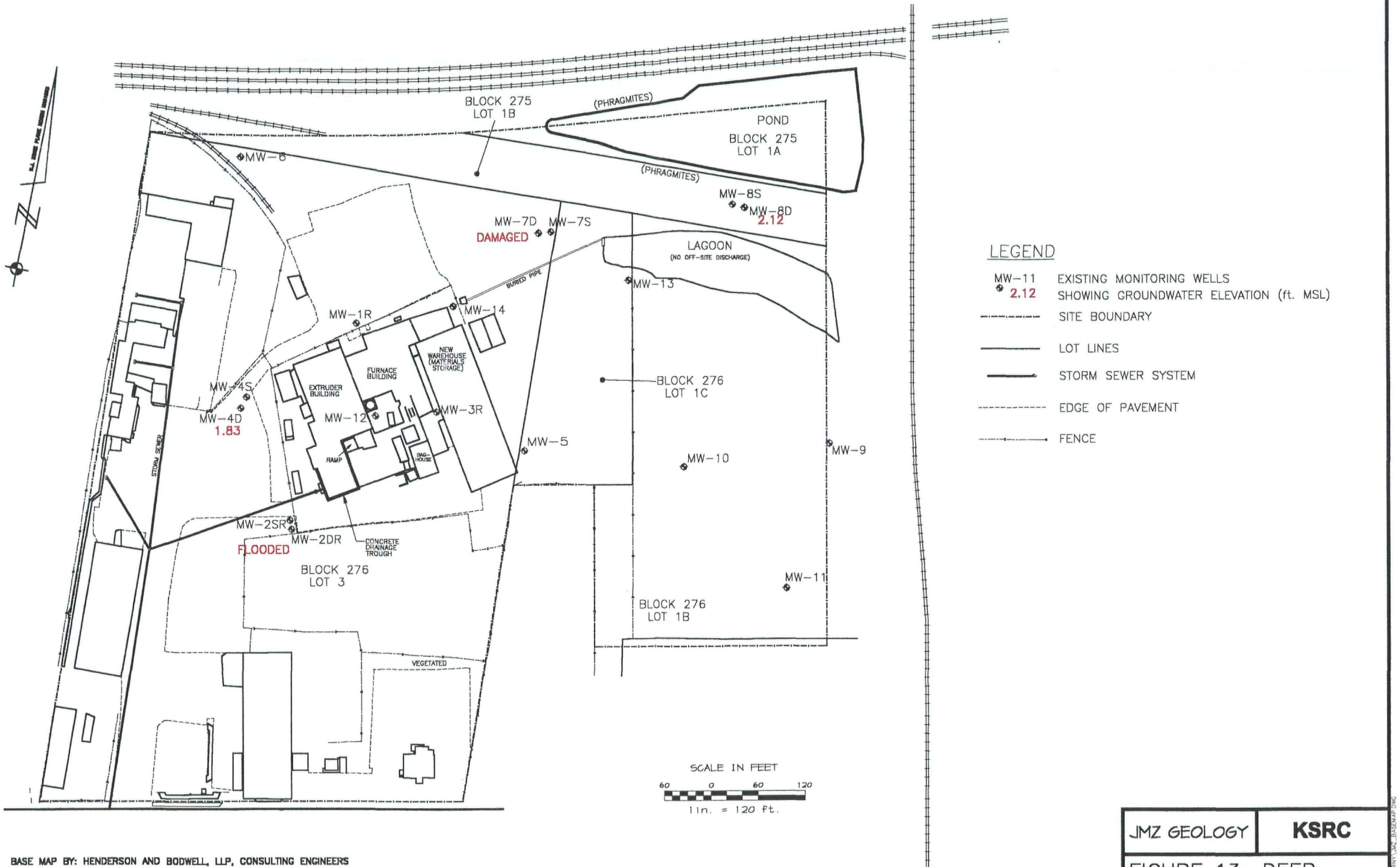


BASE MAP BY: HENDERSON AND BODWELL, LLP, CONSULTING ENGINEERS
BOUNDARY AND TOPOGRAPHIC SURVEY OF TAX MAP LOTS 1B & 2A IN BLOCK 275
AND LOTS 1B,1C & 3 IN BLOCK 276 FOR KEARNY SMELTING AND REFINING CORP.
DWG.NO. NJ227-1050, SHEET 1 OF 1, 11/16/95

JMZ GEOLOGY	KSRC

FIGURE 12: SHALLOW GROUNDWATER ELEVATION 8/16/2000

Rev. 9/00

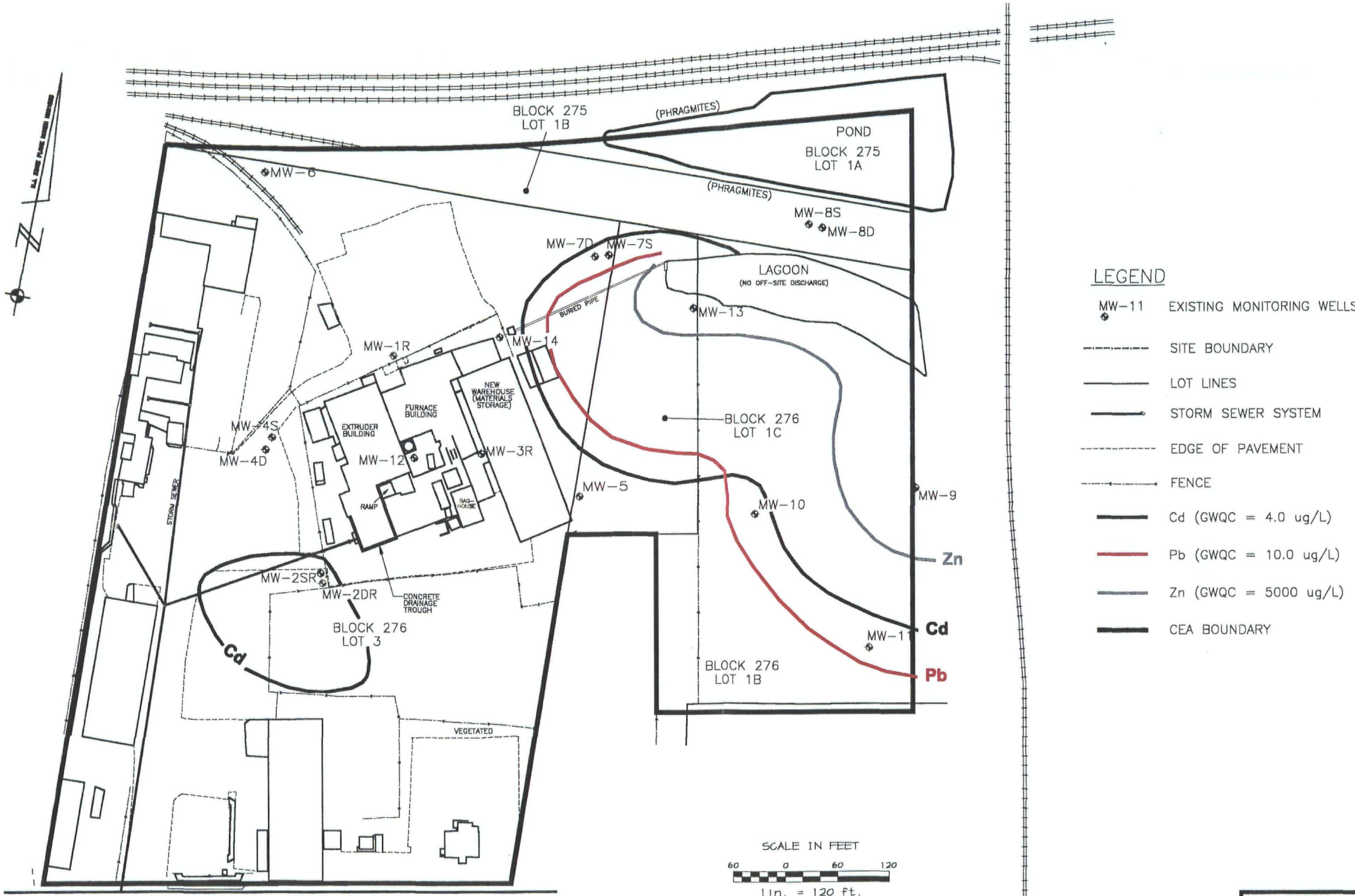


BASE MAP BY: HENDERSON AND BODWELL, LLP, CONSULTING ENGINEERS
BOUNDARY AND TOPOGRAPHIC SURVEY OF TAX MAP LOTS 1B & 2A IN BLOCK 275 AND LOTS 1B,1C & 3 IN BLOCK 276 FOR KEARNY SMELTING AND REFINING CORP. DWG.NO. NJ227-1050, SHEET 1 OF 1, 11/16/95

JMZ GEOLOGY	KSRC

FIGURE 13: DEEP GROUNDWATER ELEVATION 8/16/2000

Rev. 9/00



BASE MAP BY: HENDERSON AND BODWELL, LLP, CONSULTING ENGINEERS
BOUNDARY AND TOPOGRAPHIC SURVEY OF TAX MAP LOTS 1B & 2A IN BLOCK 275
AND LOTS 1B,1C & 3 IN BLOCK 276 FOR KEARNY SMELTING AND REFINING CORP.
DWG.NO. NJ227-1050, SHEET 1 OF 1, 11/16/95

JMZ GEOLOGY	KSRC
FIGURE 14: CEA MAP	

Rev. 9/00

APPENDICES

APPENDIX A

Historical Maps, Photos, and Documents Pertaining to KSRC

Part of KEARNY Meadows

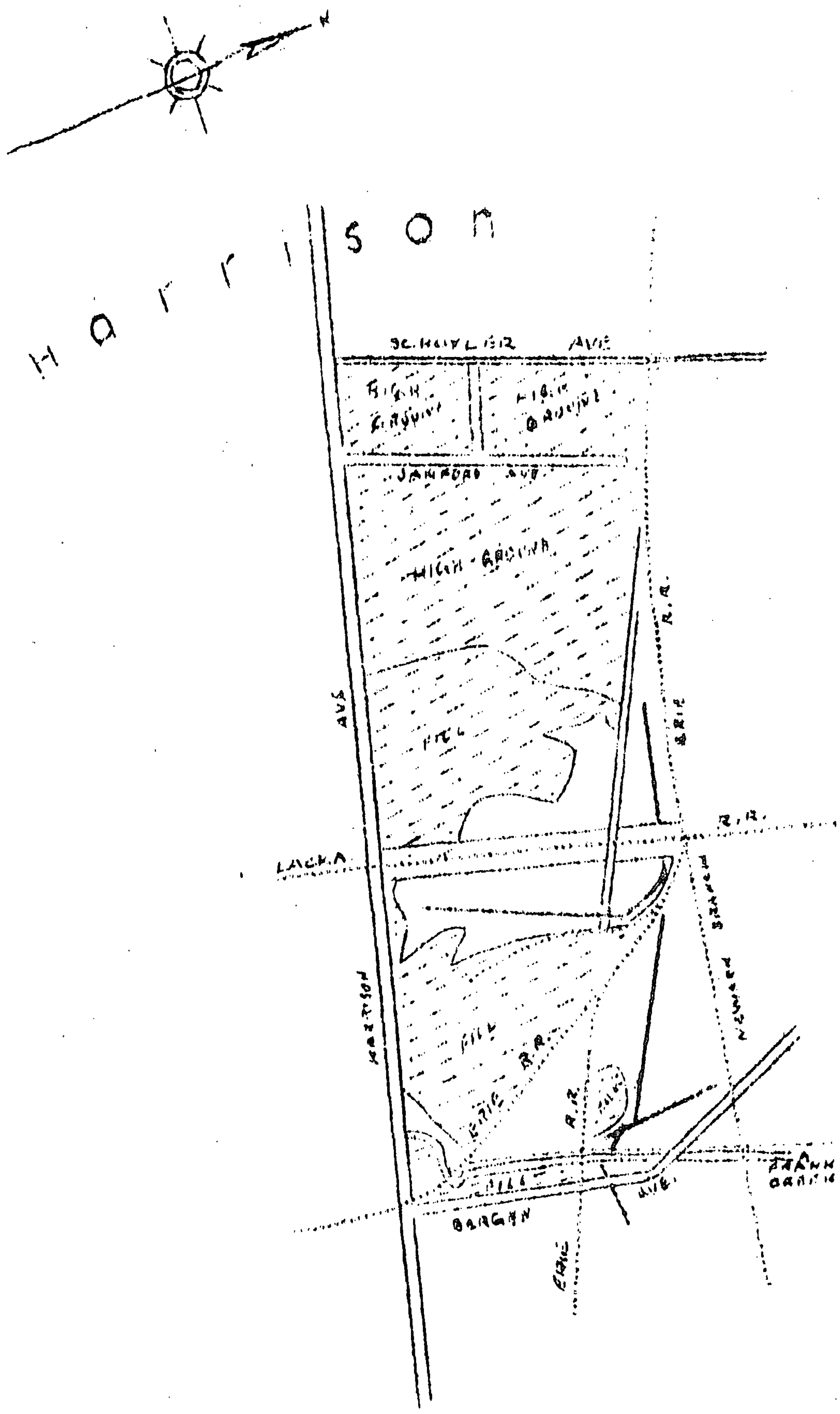


Plate II - Sec. 2

Scale 600 feet to the inch
MARCH 1938

REPORT

Date ______________

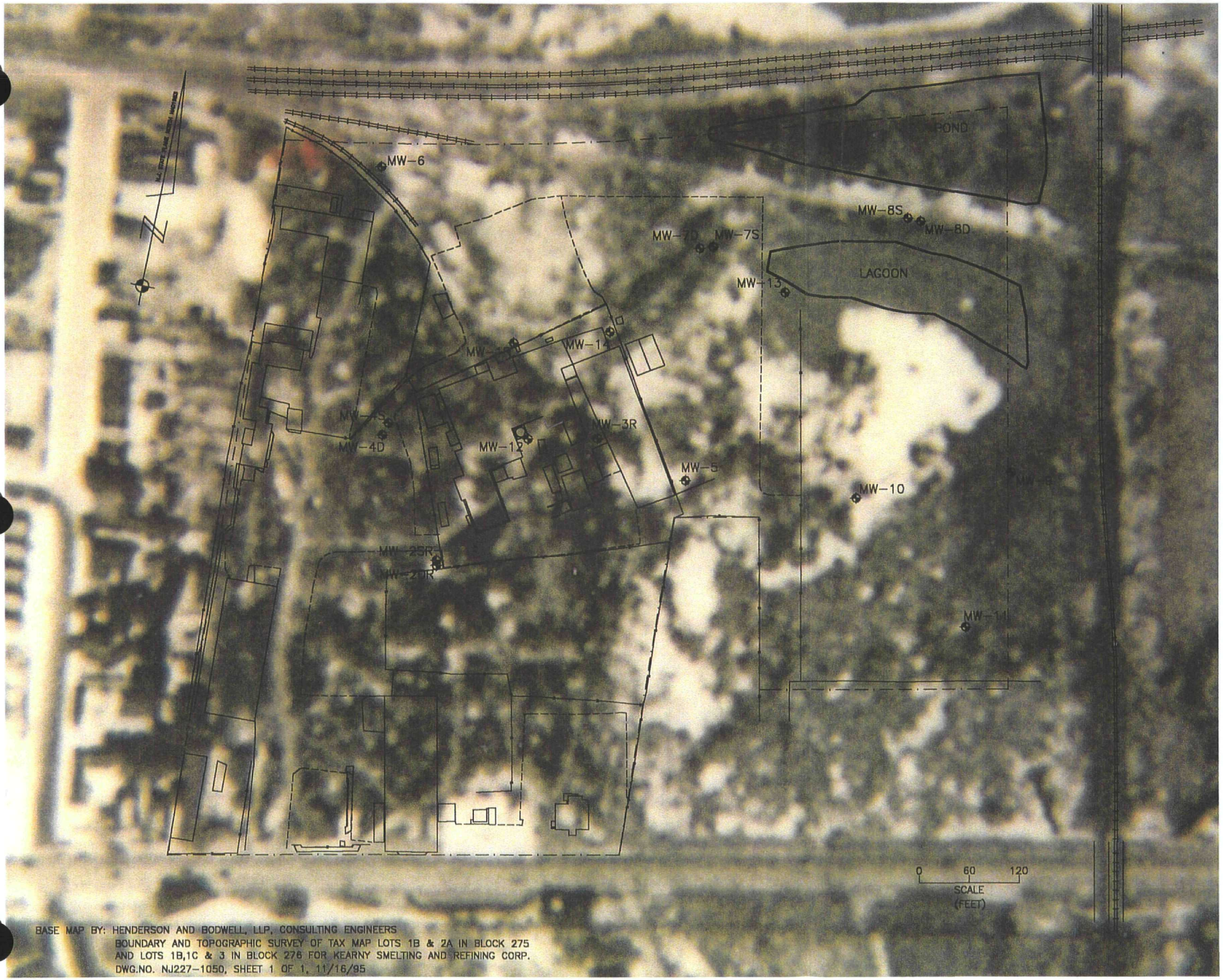
BREEDING: ____________ Sheet ____________ Ditch ________ Holes ____________

DEG: L. _____ M. _____ H. _______ STAGE: E. _____ M. _____ A. _____ P. _____

DISPOSITION OF BREEDING: ______________________________________

OIL USED: ______________________________________

____
In Charge of Work



LEGEND

BUILDINGS

SITE BOUNDARY

FENCE

PAVEMENT EDGE

SHALLOW/DEEP MONITORING WELL

JMZ GEOLOGY	KEARNY SMELTING

1932 AERIAL OVERLAY

APPENDIX B

Summary of Known Contaminated Sites

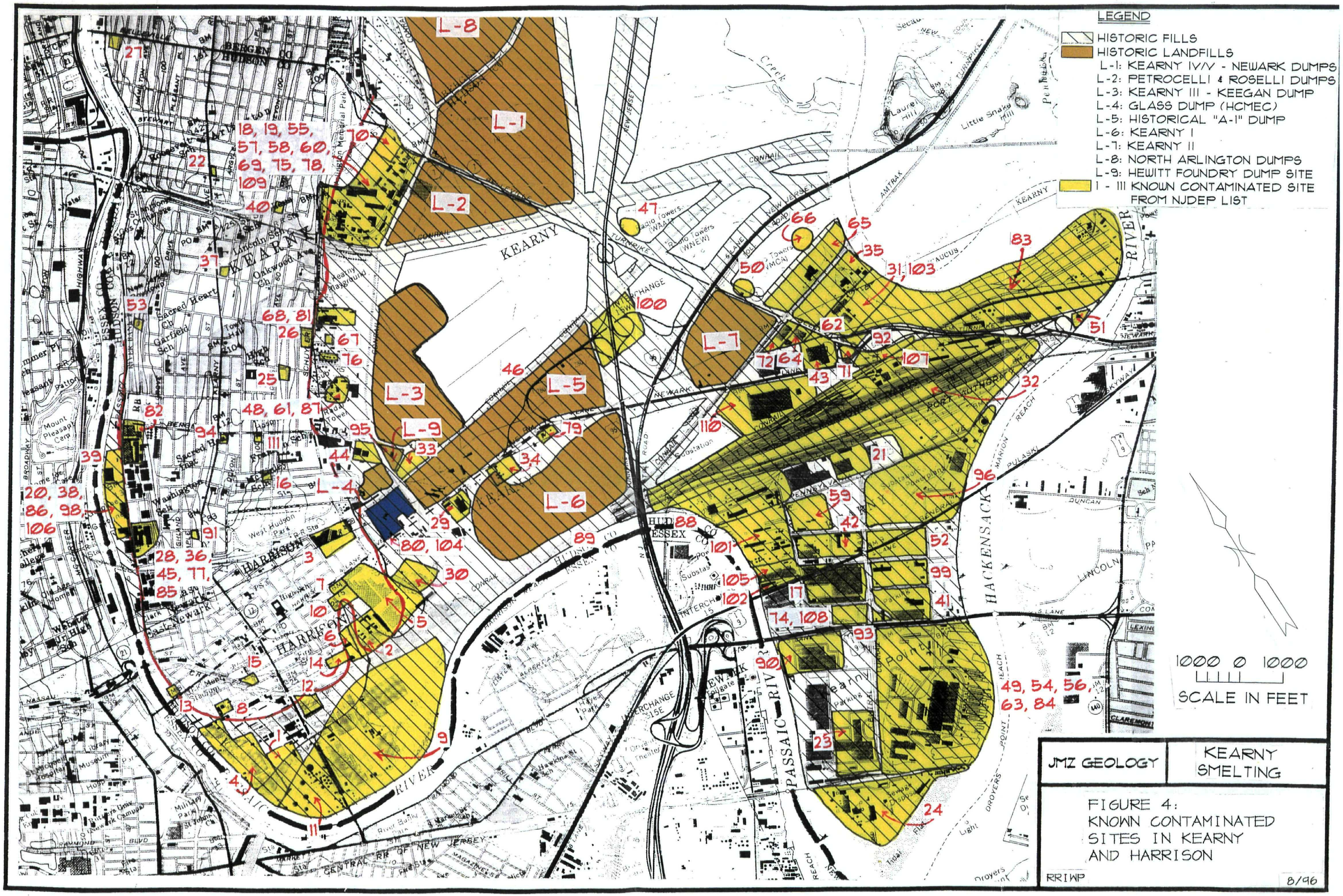


FIGURE 4:
KNOWN CONTAMINATED SITES IN KEARNY AND HARRISON

KNOWN CONTAMINATED SITES LIST: HARRISON AND KEARNY, N.J.
ALPHABETICAL LISTING

HARRISON

1. "HARRISON TOWN","1000 SOUTH INCORPORATED","1000 2NDSTS","NJD986572915""NJD986572915","ACTIVE","04/13/1989","BUST"," 0197364M"
2. "HARRISON TOWN","CAMPBELL FOUNDRYCOMPANY","2WORTHINGTON AVE","NJL500035548""NJL500035548","ACTIVE","06/22/1992","BEECRA","E9 2202"
3."HARRISON TOWN","CLAYTON CONTAINERCORPORATION","405KINGSLAND AVE","NJC876022153""NJC876022153","ACTIVE","01/12/1993","BEECRA","E 93026"
4. "HARRISON TOWN","DIAMOND SHAMROCKCHEMICALSCOMPANY","ESSEX& 1STSTS","NJL500009196""NJL500009196","ACTIVE","01/16/1991","BEECRA" "E8 6335"
5. "HARRISON TOWN","DRESSER PUMPINDUSTRIESINCORPORATED","401 WORTHINGTON AVE","NJD980786222""NJD980786222","ACTIVE","10/31/1991","BEECRA","E 85034"
6. "HARRISON TOWN","EAGLE AFFILIATESINCORPORATED","505MANOR AVE","NJL600238836""NJL600238836","ACTIVE","01/11/1995","BUST","0267 032"
7. "HARRISON TOWN","FMB SYSTEMSINCORPORATED","70WORTHINGTON AVE","NJL500011960""NJL500011960","ACTIVE","01/12/1993","BEECRA","E9 3027"
8. "HARRISON TOWN","GLOUBE MANUFACTURINGCOMPANY","3001ST ST","NJD002159192""NJD002159192","ACTIVE","12/12/1994","BEECRA","E9 4132"
9. "HARRISON TOWN","GUYON GENERAL PIPING","900 FRANKEROGERS BLVD S","NJD002524015""NJD002524015","ACTIVE","05/04/1993","BUST","02262 44"
10. "HARRISON TOWN","HARRISON BAKING COMPANYTRUCKGARAGE","840 JERSEY ST","NJD986610954""NJD986610954","ACTIVE","07/23/1993","BUST","0120 502"
11. "HARRISON TOWN","HARRISON COAL GAS (PSE&G)","FRANKEROGERS BLVD S(S 4TH ST)","NJD981134117""NJD981134117","ACTIVE","08/26/1994","BSCM","NJD 981134117"
12. "HARRISON TOWN","HARTZ MOUNTAINCORPORATION","600FRANK E RODGERS BLVD S","NJD058109158""NJD058109158","ACTIVE","05/24/1993","BEECRA","E93 126"

13. "HARRISON TOWN","HESS SERVICE STATIONHARRISONTOWN","PASSAIC ST & HARRISON AVE" "NJD982797532""NJD982797532","ACTIVE","08/01/1990","BUST","008 4035"
14. "HARRISON TOWN","LIQUID CARBONIC SPECIALTY GASCORP","670ESSEX ST","NJD040741092""NJD040741092","ACTIVE","09/28/1994","BEECRA","E9 1293"
15. "HARRISON TOWN","TUNGSTEN ALLOYMANUFACTURINGCOMPANY INC","306 SUSSEX ST","NJD002175792""NJD002175792","ACTIVE","09/08/1989","BEECRA","E8 9304""NJD002175792","ACTIVE","07/03/1990","BEECRA","E90344"

KEARNY

16. "KEARNY TOWN","A 1 AUTOMOTIVE","63DAVISAVE","NJL800028730""NJL800028730","ACTIVE","1 2/28/1993","BFO-IN","NJL800028730-001"
17. "KEARNY TOWN","ACME MARKETS INCORPORATED","CENTRALAVE& 2ND ST","NJC876010034""NJC876010034","ACTIVE","02/10/1995","BUST","0247 016"
18. "KEARNY TOWN","ALPHA METALSINCORPORATED","680SCHUYLER AVE","NJD000632596""NJD000632596","ACTIVE","03/22/1993","BEECRA","E 93151"
19. "KEARNY TOWN","ALPHA METALSINCORPORATED","590BELLEVILLE TPKE","NJD001834126""NJD001834126","ACTIVE","09/28/1992","BEECRA","E 92427"
20. "KEARNY TOWN","AMERICAN MODERN METALS","65PASSAICAVE","NJD002203123""NJD002203123","ACTIVE","05/2 7/1992","BEECRA","E92264""NJD002203123","ACTIVE","06/15/1992","BEECR A","E88785"
21. "KEARNY TOWN","AMERICAN PRESIDENTLINES","123PENNSYLVANIA AVE","NJD981487598""NJD981487598","ACTIVE","02/01/1993","BUST","009 9183"
22. "KEARNY TOWN","AMOCO SERVICE STATION KEARNYTOWN","700KEARNY AVE","NJX000278408""NJX000278408","ACTIVE","06/09/1989","BUST","001 3862"
23. "KEARNY TOWN","AT&T TECHNOLOGIESINCORPORATED","100CENTRAL AVE","NJD002139053""NJD002139053","ACTIVE","07/08/1985","BEECRA","E 84025"
24. "KEARNY TOWN","BASF WYANDOTTE CORPORATION","50CENTRALAVE","NJD046941530""NJD046941530","ACTIVE ","08/13/1990","BEECRA","E90537"
25. "KEARNY TOWN","BATEL SERVICE STATION &REPAIRS","250DAVIS AVE","NJL600166953""NJL600166953","PENDING","10/15/1993","BAC","931 045"

26. "KEARNY TOWN","BRENNAN COMPANYINCORPORATED","407SCHUYLER AVE","NJL800036535""NJL800036535","ACTIVE","11/30/1994","BAC","0050393"
27. "KEARNY TOWN","BUDGET RENT A CAR","946PASSAICAVE","NJL600215685""NJL600215685","ACTIVE","01/21/1993","BUST","0242282"
28. "KEARNY TOWN","C&J CUSTOM CYCLES","60PASSAICAVE","NJL500005434""NJL500005434","ACTIVE","06/15/1992","BEECRA","E88A38"
29. "KEARNY TOWN","CAMPBELL FOUNDRYCOMPANY","1235HARRISON AVE","NJD002457273""NJD002457273","ACTIVE","07/01/1992","BFO-M","920124SP01M"
30. "KEARNY TOWN","CAPITAL CITY PRODUCTS COMPANY","FOOTOFSANFORD AVE","NJD154287544""NJD154287544","ACTIVE","05/25/1990","BEECRA","E84316"
31. "KEARNY TOWN","CLOROBEN CHEMICALCORPORATION","1035BELLEVILLE TPKE","NJD002175107""NJD002175107","ACTIVE","05/03/1993","BEECRA","E93261"
32. "KEARNY TOWN","CONRAIL MEADOWSYARD","PENNSYLVANIAAVE","NJD980770028""NJD980770028","ACTIVE","03/01/1993","BFCM","NJD980770028"
33. "KEARNY TOWN","DEAD HORSE CREEKREGIONCONTAMINATION","DUKES ST","NJL000053785""NJL000053785","PENDING","12/07/1992","BFO-M","921251"
34. "KEARNY TOWN","DIAMOND HEAD OIL REFINERY","1401HARRISONTPKE","NJD092226000""NJD092226000","PENDING","08/26/1994","BFO-CA","930447"
35. "KEARNY TOWN","DIAMONDSHAMROCKCORPORATION","BELLEVILLE TPKE","NJD002442408""NJD002442408","ACTIVE","04/17/1990","BFCM","NJD002442408"
36. "KEARNY TOWN","ENDRE DOCZY","BELGROVE DR &PASSAICAVE","NJL500010707""NJL500010707","ACTIVE","06/15/1992","BEECRA","E88892"
37. "KEARNY TOWN","EXXON SERVICE STATIONKEARNY","514KEARNY AVE","NJD986598704""NJD986598704","ACTIVE","02/25/1991","BUST","0077989"
38. "KEARNY TOWN","FERBER PLASTICMANUFACTURING","65PASSAIC AVE","NJL500011663""NJL500011663","ACTIVE","06/15/1992","BEECRA","E88A36""NJL500011663","ACTIVE","06/15/1992","BEECRA","E88A39""NJL500011663","ACTIVE","06/15/1992","BEECRA","E92287"
39. "KEARNY TOWN","FRANKLIN PLASTICSCORPORATION","127PASSAIC AVE","NJD011121589""NJD011121589","ACTIVE","06/17/1993","BEECRA","E86026"

40. "KEARNY TOWN","FREDERICK GUMM CHEMICALCOMPANYINC","538 FOREST ST","NJD002175636""NJD002175636","ACTIVE","12/28/1988","BUST","0002 170"
41. "KEARNY TOWN","FRUEHAUF TRAILERCORPORATION","15HACKENSACK AVE","NJD014960587""NJD014960587","ACTIVE","07/24/1992","BFO-M","91 12091545M"
42. "KEARNY TOWN","GARDNER ASPHALTCORPORATION","80JACOBUS AVE","NJD000692129""NJD000692129","PENDING","07/26/1993","BFO-M","9 307145"
43."KEARNY TOWN","GOODY PRODUCTSINCORPORATED","969NEWARK TPKE","NJD001340876""NJD001340876","ACTIVE","09/20/1993","BEECRA","E 93466"
44. "KEARNY TOWN","GUIGNON & GREEN COMPANY","410BERGENAVE","NJD980757579""NJD980757579","PENDING"," 02/16/1993","BFO-M","930206"
45. "KEARNY TOWN","H&G INDUSTRIES","BELGROVE DR &PASSAICAVE","NJL500014113""NJL500014113","ACTIVE","06/15/1992","BE ECRA","E88891"
46. "KEARNY TOWN","HMDC SANITARY LANDFILL 1A","BELLEVILLETPKE & HARRISON AVE","NJD981877715""NJD981877715","PENDING","04/08/1993","BFO-CA"," 9303270"
"KEARNY TOWN","HUDSON COUNTY CHROMATE-OCCIDENTAL","VARIOUS LOCATIONS","NJL000005025""NJL000005025","ACTIVE","04/17/1990","BFCM ","NJL000005025"
47. "KEARNY TOWN","HUDSON COUNTY CHROMATE103","BELLEVILLETPKE","NJL000001032""NJL000001032","ACTIVE ","04/17/1990","BFCM","NJL000001032"
48. "KEARNY TOWN","HUDSON COUNTY CHROMATE110","200GARFIELD AVE","NJL000001107""NJL000001107","ACTIVE","04/17/1990","BFCM","NJL0 00001107"
49. "KEARNY TOWN","HUDSON COUNTY CHROMATE126","86HACKENSACK AVE","NJL000001263""NJL000001263","ACTIVE","04/17/1990","BFCM","NJL0 00001263"
50. "KEARNY TOWN","HUDSON COUNTY CHROMATE131","BELLEVILLETPKE","NJL000001313""NJL000001313","ACTIVE ","04/17/1990","BFCM","NJL000001313"
51. "KEARNY TOWN","HUDSON COUNTY CHROMATE145","2FISHHOUSE RD","NJL000001453""NJL000001453","ACTIVE","04/01/1992","BFCM","NJL00 0001453"
52. "KEARNY TOWN","HUDSON COUNTY CHROMATE167","CENTRALAVE & 3RD ST","NJL000001677""NJL000001677","ACTIVE","04/17/1990","BFCM","NJL00 0001677"

53. "KEARNY TOWN","HUDSON COUNTY CHROMATE 168","80PARKAVE","NJL000001685""NJL000001685","ACTIVE","04/17/1990", "BFCM","NJL000001685"
54. "KEARNY TOWN","HUDSON COUNTY CHROMATE169","CENTRALAVE","NJL000001693""NJL000001693","ACTIVE"," 04/17/1990","BFCM","NJL000001693"
55. "KEARNY TOWN","HUDSON COUNTY CHROMATE 170","OBRIENRD","NJL000001701""NJL000001701","ACTIVE","04/17/1990"," BFCM","NJL000001701"
56. "KEARNY TOWN","HUDSON COUNTY CHROMATE171","CENTRALAVE","NJL000001719""NJL000001719","ACTIVE"," 04/17/1990","BFCM","NJL000001719"
57. "KEARNY TOWN","HUDSON COUNTYCHROMATE193","MCWHIRTER RD & SELLERS ST","NJL000071613""NJL000071613","ACTIVE","01/30/1995","BFCM","NJL000001933"
58. "KEARNY TOWN","HUDSON COUNTY CHROMATE 41","O BRIENRD& SELLERS ST","NJL000000414""NJL000000414","ACTIVE","04/17/1990","BFCM","NJL000000414"
59. "KEARNY TOWN","HUDSON COUNTY CHROMATE 42","90 TO94 &98 TO 102 JACOBUS AVE","NJL000000422""NJL000000422","ACTIVE","04/17/1990","BFCM","NJL000000422"
60. "KEARNY TOWN","HUDSON COUNTY CHROMATE 45","OBRIENRD","NJL000000455""NJL000000455","ACTIVE","04/17/1990","BFCM","NJL000000455"
61. "KEARNY TOWN","HUDSON COUNTY CHROMATE 46","79 TO853RD AVE","NJL000000463""NJL000000463","ACTIVE","04/17/1990","BFCM","NJL000000463"
62. "KEARNY TOWN","HUDSON COUNTY CHROMATE 47","1010RTE 7(BELLEVILLE TPKE)","NJL000000471""NJL000000471","ACTIVE","04/17/1990","BFCM","NJL000000471"
63. "KEARNY TOWN","HUDSON COUNTY CHROMATE 48","1000RTE 7(BELLEVILLE TPKE)","NJL000000489""NJL000000489","ACTIVE","04/17/1990","BFCM","NJL000000489"
64. "KEARNY TOWN","HUDSON COUNTY CHROMATE49","100HACKENSACK AVE","NJL000000497""NJL000000497","ACTIVE","04/17/1990","BFCM","NJL000000497"
65. "KEARNY TOWN","HUDSON COUNTY CHROMATE50","933BELLEVILLE TPKE","NJL000000505""NJL000000505","ACTIVE","04/17/1990","BFCM","NJL000000505"

66. "KEARNY TOWN","HUDSON COUNTY CHROMATE 51","RTE7(BELLEVILLE TPKE)","NJL000000513""NJL000000513","ACTIVE","04/17/1990","BFCM","NJL000000513"
67. "KEARNY TOWN","HUDSON COUNTY CHROMATE 52","100QUINCYST","NJL000000521""NJL000000521","ACTIVE","04/17/1990","BFCM","NJL000000521"
68. "KEARNY TOWN","HUDSON COUNTY CHROMATE53","450SCHUYLER AVE","NJL000000539""NJL000000539","ACTIVE","04/17/1990","BFCM","NJL000000539"
69. "KEARNY TOWN","HUDSON COUNTY CHROMATE54","MCWHIRTER& GROSS RDS","NJL000000547""NJL000000547","ACTIVE","04/17/1990","BFCM","NJL000000547"
70. "KEARNY TOWN","HUDSON COUNTY CHROMATE55","520BELLEVILLE TPKE","NJL000000554""NJL000000554","ACTIVE","04/17/1990","BFCM","NJL000000554"
71. "KEARNY TOWN","HUDSON COUNTY CHROMATE56","BELLEVILLETPKE & OLD NEWARK RD","NJL000000562""NJL000000562","ACTIVE","04/17/1990","BFCM","NJL000000562"
72. "KEARNY TOWN","HUDSON COUNTY CHROMATE58","996BELLEVILLE TPKE","NJL000000588""NJL000000588","ACTIVE","04/17/1990","BFCM","NJL000000588"
73. "KEARNY TOWN","HUDSON COUNTY CHROMATE59","NEWARKJERSEY CITY TPKE","NJL000000596""NJL000000596","ACTIVE","04/17/1990","BFCM","NJL000000596"
74. "KEARNY TOWN","HUDSON COUNTY CHROMATE 60","61LINCOLNHWY","NJL000000604""NJL000000604","ACTIVE","04/17/1990","BFCM","NJL000000604"
75. "KEARNY TOWN","HUDSON COUNTY CHROMATE61","590BELLEVILLE TPKE","NJL000000612""NJL000000612","ACTIVE","04/17/1990","BFCM","NJL000000612"
76. "KEARNY TOWN","HUDSON COUNTY CHROMATE62","60ARLINGTON AVE","NJL000000620""NJL000000620","ACTIVE","04/17/1990","BFCM","NJL000000620"
77. "KEARNY TOWN","JAY ARE FASHIONSCORPORATION","60PASSAIC AVE","NJL500017058""NJL500017058","ACTIVE","06/15/1992","BEECRA","E88A37"
78. "KEARNY TOWN","JERYL INDUSTRIESINCORPORATED","590BELLEVILLE TPKE","NJL600205165""NJL600205165","PENDING","11/07/1994","BAC","941132"
79. "KEARNY TOWN","KEARNYCONNECTION","HARRISONAVE","NJL000069070""NJL000069070","ACTIVE","08/10/1993","BFCM","NJL000069070"

80. "KEARNY TOWN","KEARNY SMELTING &
REFININGCOMPANY","936HARRISON
AVE","NJD002520401""NJD002520401","ACTIVE","06/01/1989","BFCM","NJD
002520401"
81. "KEARNY TOWN","KLEER KAST
INCORPORATED","450SCHUYLERAVE","NJD056708688""NJD056708688","AC
TIVE","10/28/1992","BUST","0243218"
82. "KEARNY TOWN","KMART","200
PASSAICAVE","NJD986615722""NJD986615722","PENDING","04/09/1993","B
FO-M","930415"
83. "KEARNY TOWN","KOPPERS COMPANY INCSEABOARDPLANT","FISH
HOUSE
RD","NJD002445112""NJD002445112","ACTIVE","04/01/1992","BSCM","NJD0
02445112"
84. "KEARNY TOWN","KUEHNE CHEMICALCOMPANY","86HACKENSACK
AVE","NJD011239167""NJD011239167","ACTIVE","07/20/1993","BFO-M","92
11160935M"
85. "KEARNY TOWN","LAGO SERVICECENTERINCORPORATED","PASSAIC AVE
&BELGROVEDR","NJL600235378"
"NJL600235378","ACTIVE","09/16/1994","BUST","0096087"
86. "KEARNY TOWN","MARSHALL CLARKMANUFACTURINGCOMPANY","65
PASSAIC
AVE","NJL500020342""NJL500020342","ACTIVE","06/15/1992","BEECRA","E8
8787""NJL500020342","ACTIVE","06/15/1992","BEECRA","E92286"
87. "KEARNY TOWN","MATCO TRANSPORTATIONINCORPORATED","973RD
AVE","NJL600055966""NJL600055966","ACTIVE","08/12/1992","BUST","0088
176""NJL600055966","PENDING","02/06/1995","BUST","950218"
88. "KEARNY
TOWN","MONSANTOCOMPANY","PENNSYLVANIAAVE","NJD002444933""NJD0
02444933","ACTIVE","04/01/1992","BSCM","NJD002444933"
89. "KEARNY TOWN","MUNICIPAL SANITARYLANDFILLAUTHORITY","1500
HARRISON
AVE","NJD981877673""NJD981877673","PENDING","05/07/1993","BFO-CA","
910868-P"
90. "KEARNY TOWN","NEW YORKNEWSINCORPORATED","HACKENSACK AVE
BLDG1
RIVERTERMINALDEV","NJD980757371""NJD980757371","ACTIVE","02/24/199
2","BEECRA","E91162"
91. "KEARNY TOWN","NICTOS SERVICE INCORPORATED","52 TO58KEARNY
AVE","NJL600127351""NJL600127351","PENDING","08/17/1994","BAC","940
885"
92. "KEARNY TOWN","NJ TRANSIT INCORPORATED","1148NEWARKJERSEY
CITY
TPKE","NJD986619146""NJD986619146","ACTIVE","04/17/1991","BSCM","96
5"

93. "KEARNY TOWN","PANTASOTE INCORPORATEDWALLCOVERINGDIV","85 LINCOLN HWY (RIVER TERMINALDEV)","NJD001386283""NJD001386283","ACTIVE","10/25/1994","BAC","E88983"
94. "KEARNY TOWN","PERFORMANCE MOTORSINCORPORATED","116TO 122 BERGEN AVE","NJL600121867""NJL600121867","ACTIVE","03/13/1995","BUST","0191658"
95. "KEARNY TOWN","PORT O SAN CORPORATION","450BERGENAVE","NJL600026892""NJL600026892","ACTIVE","03/17/1995","BFO-CA","941005092737"
96. "KEARNY TOWN","PSE&G KEARNY GENERATINGSTATION","FOOTOF HACKENSACK AVE","NJD000730424""NJD000730424","ACTIVE","02/22/1995","BFCM","NJD000730424"
97. "KEARNY TOWN","REED MINERALS","339CENTRALAVE","NJD981177249""NJD981177249","ACTIVE","04/04/1991","BFCM","NJL000001768"
98. "KEARNY TOWN","RMS SPORTSWEARINCORPORATED","65PASSAIC AVE","NJL500027842""NJL500027842","ACTIVE","06/15/1992","BEECRA","E88786""NJL500027842","ACTIVE","06/15/1992","BEECRA","E92285"
99. "KEARNY TOWN","ROADWAY EXPRESS INCORPORATED","722NDST","NJD064292261""NJD064292261","ACTIVE","03/15/1995","BUST","0019280"
100. "KEARNY TOWN","ROUTE 508 & NJ TURNPIKE","RTE 508 & NJTPKEEXIT 15W","NJL000010157""NJL000010157","ACTIVE","04/01/1992","BFCM","NJL000010157"
101. "KEARNY TOWN","S & W WASTE INCORPORATED","105 &115JACOBUS AVE","NJD991291105""NJD991291105","ACTIVE","12/20/1993","BFCM","NJD991291105"
102. "KEARNY TOWN","SPECTRASERV INCORPORATED","75JACOBUSAVE","NJD049851892""NJD049851892","ACTIVE","03/17/1994","BFCM","NJD049851892"
103. "KEARNY TOWN","STANDARD CHLORINE CHEMICALCOMPANYINC","1015 TO1035 BELLEVILLE TPKE","NJD002175057""NJD002175057","ACTIVE","","BFCM","NJD045653854""NJD002175057","ACTIVE","03/14/1994","BSCM","NJD002175057""NJD002175057","ACTIVE","08/08/1994","BFCM","NJD002175057-001"
104. "KEARNY TOWN","SUNOCO SERVICE STATIONKEARNYTOWN","936 HARRISON AVE","NJD000700260""NJD000700260","PENDING","02/23/1995","BAC","9502117"
105. "KEARNY TOWN","SYNCON RESINS","77JACOBUSAVE","NJD064263817""NJD064263817","ACTIVE","09/10/1991","BSM","910803"

106. "KEARNY TOWN","TOP NOTCH INDUSTRYINCORPORATED","65PASSAIC AVE","NJL500035902""NJL500035902","ACTIVE","06/15/1992","BEECRA","E9 2284"

107. "KEARNY TOWN","TROPICANA PRODUCTSINCORPORATED","1150HARRISON TPKE","NJD082992298""NJD082992298","ACTIVE","07/23/1992","BUST","01 12169"

108. "KEARNY TOWN","TULLOS TRUCK STOP (EXXONSTATION)","61LINCOLN HWY","NJD045446630""NJD045446630","PENDING","01/30/1995","BSCM","9 20914"

109. "KEARNY TOWN","TURCO INDUSTRIAL PARK","590BELLEVILLETPKE","NJD981490378""NJD981490378","PENDING","1 1/29/1993","BSCM","931180"

110. "KEARNY TOWN","US POSTAL SERVICE","850 NEWARKJERSEYCITY TPKE","NJ1180410259""NJ1180410259","ACTIVE","07/01/1992","BFO-M","91 02041744M"

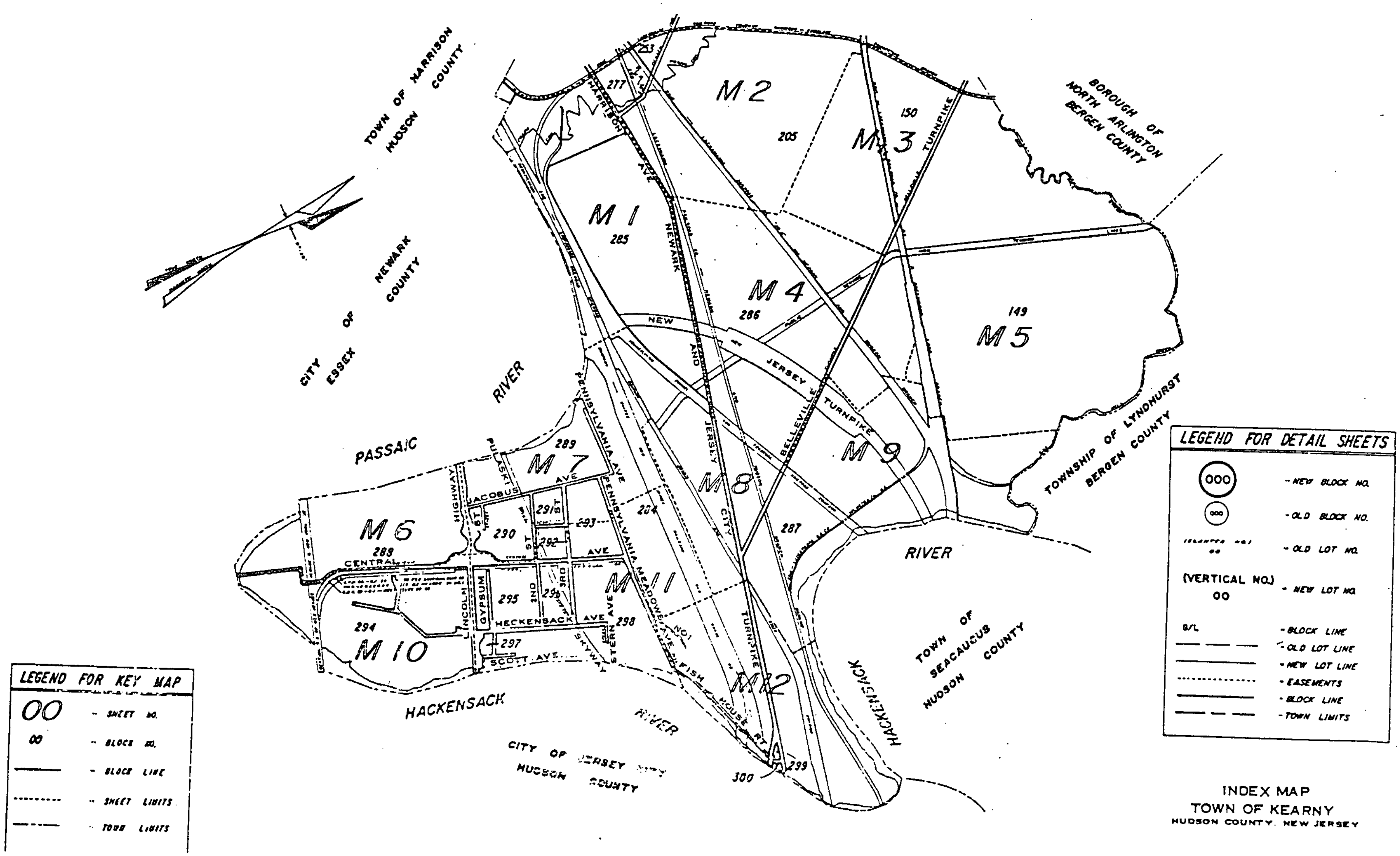
111. "KEARNY TOWN","WEST HUDSON HOSPITALLABORATORY","206BERGEN AVE","NJD064978562""NJD064978562","ACTIVE","06/02/1993","BUST","018 6249"

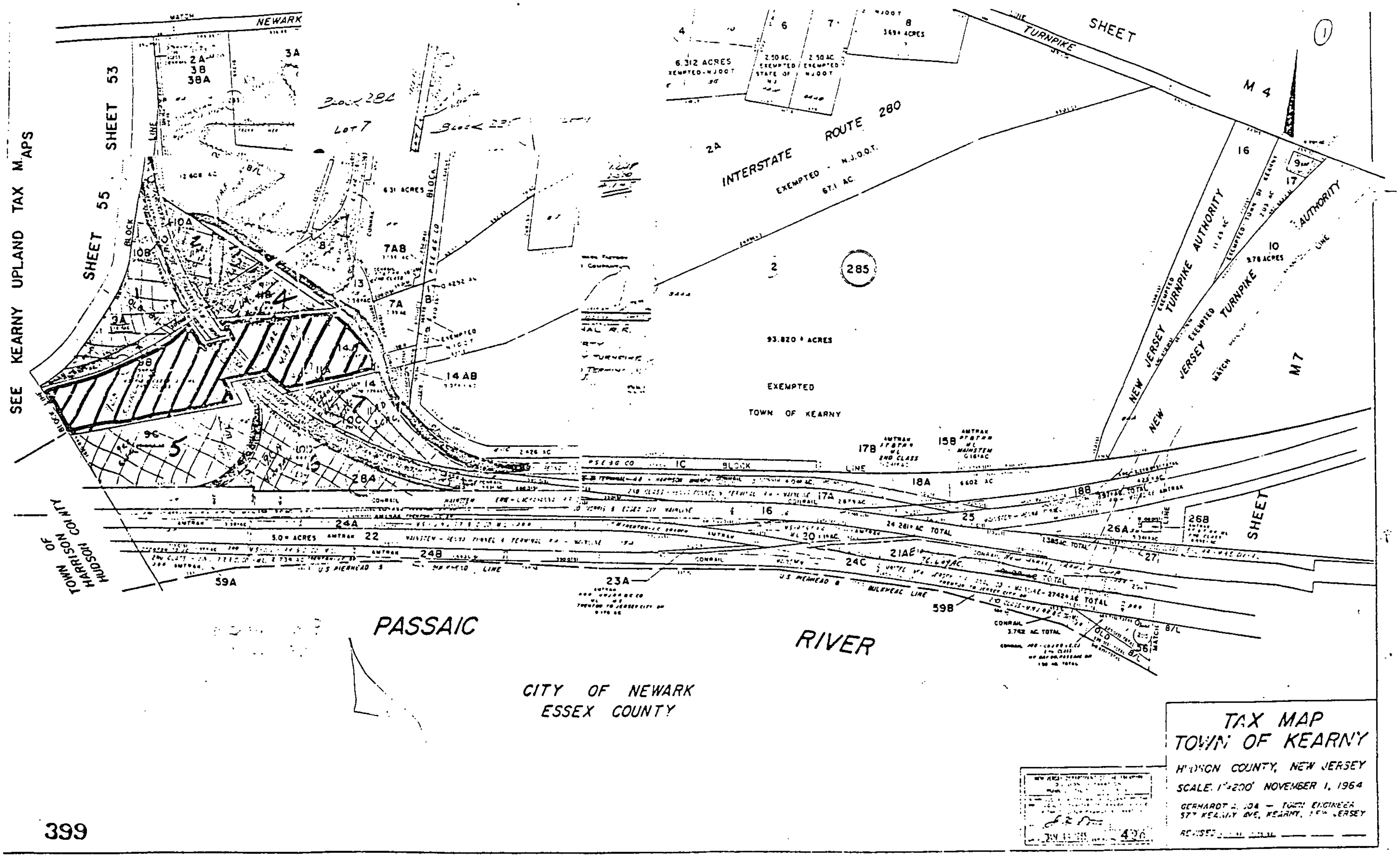
APPENDIX C

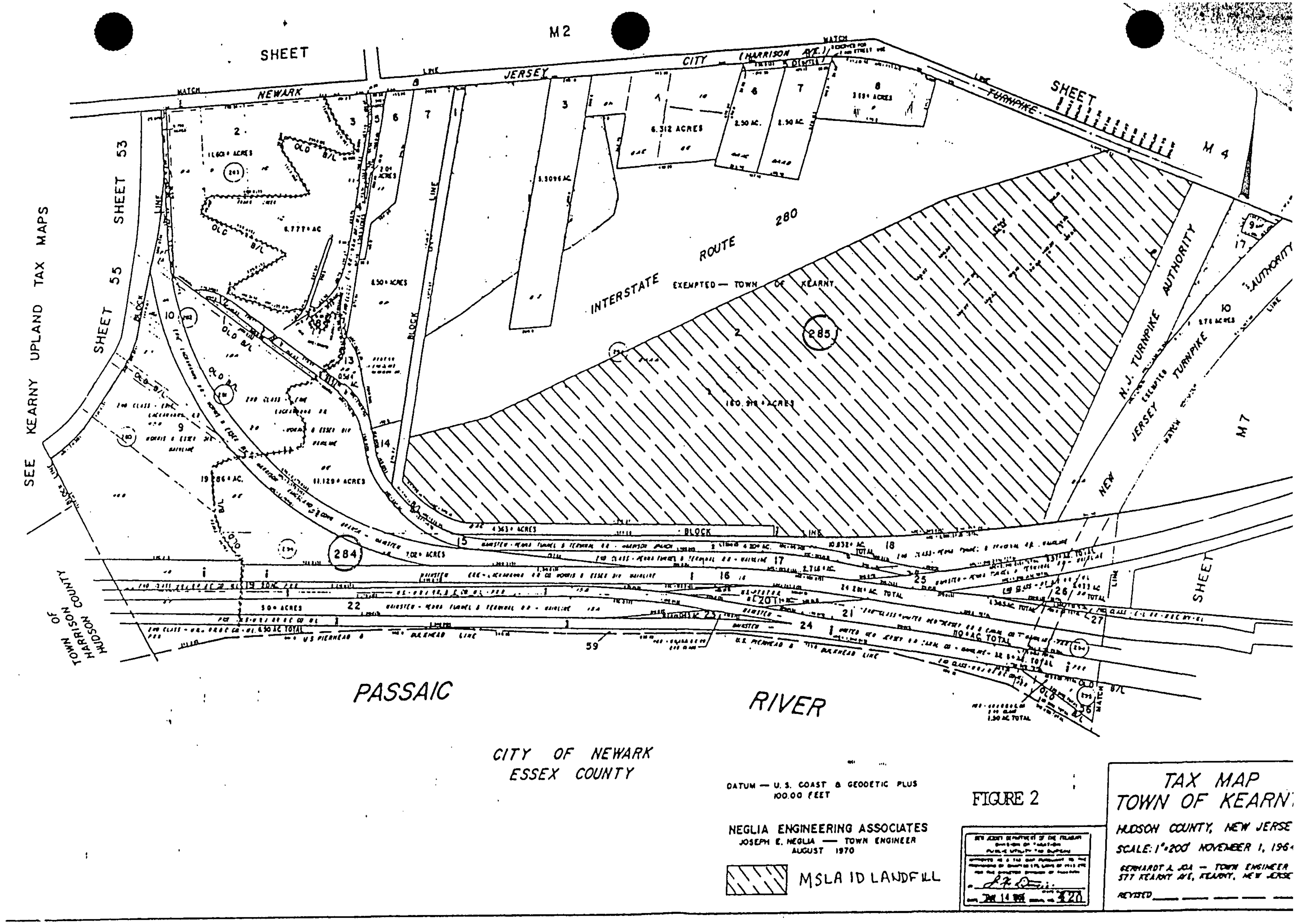
Historical Maps, Photos, and Documents Pertaining to Other Sites

C1. General

MEADOWLAND - KEY MAP

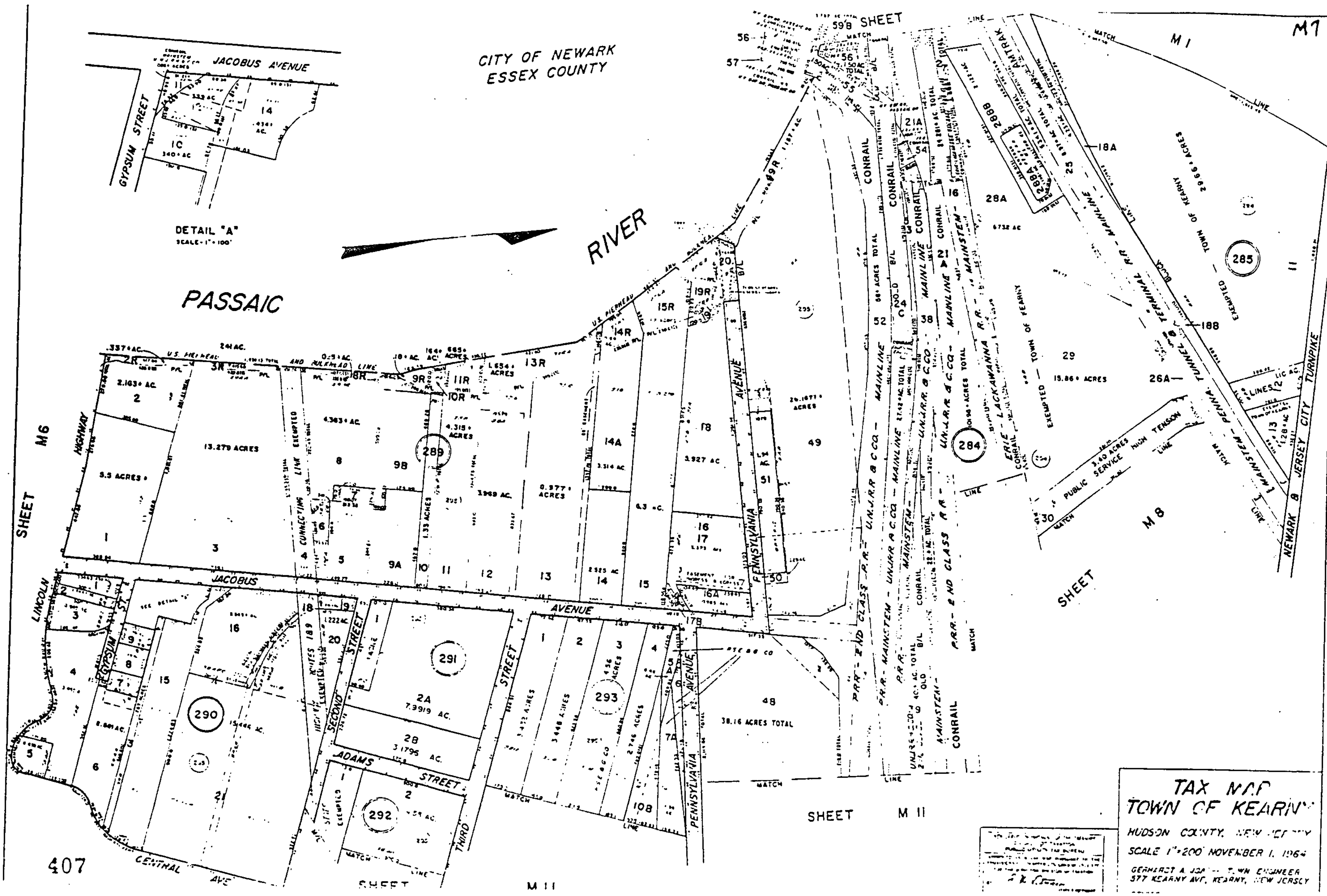



NEWARK
TURNPIKE
SHEET M 4
SHEET 53
SHEET 55
SEE KEARNY UPLAND TAX MAPS
INTERSTATE ROUTE 280
EXEMPTED - N.J.D.O.T.
67.1 AC.
285
93.820 ± ACRES
EXEMPTED
TOWN OF KEARNY
NEW JERSEY TURNPIKE AUTHORITY
M7
SHEET
TOWN OF HARRISON HUDSON COUNTY
PASSAIC
RIVER
CITY OF NEWARK
ESSEX COUNTY
TAX MAP
TOWN OF KEARNY
HUDSON COUNTY, NEW JERSEY
SCALE: 1"=200' NOVEMBER 1, 1964



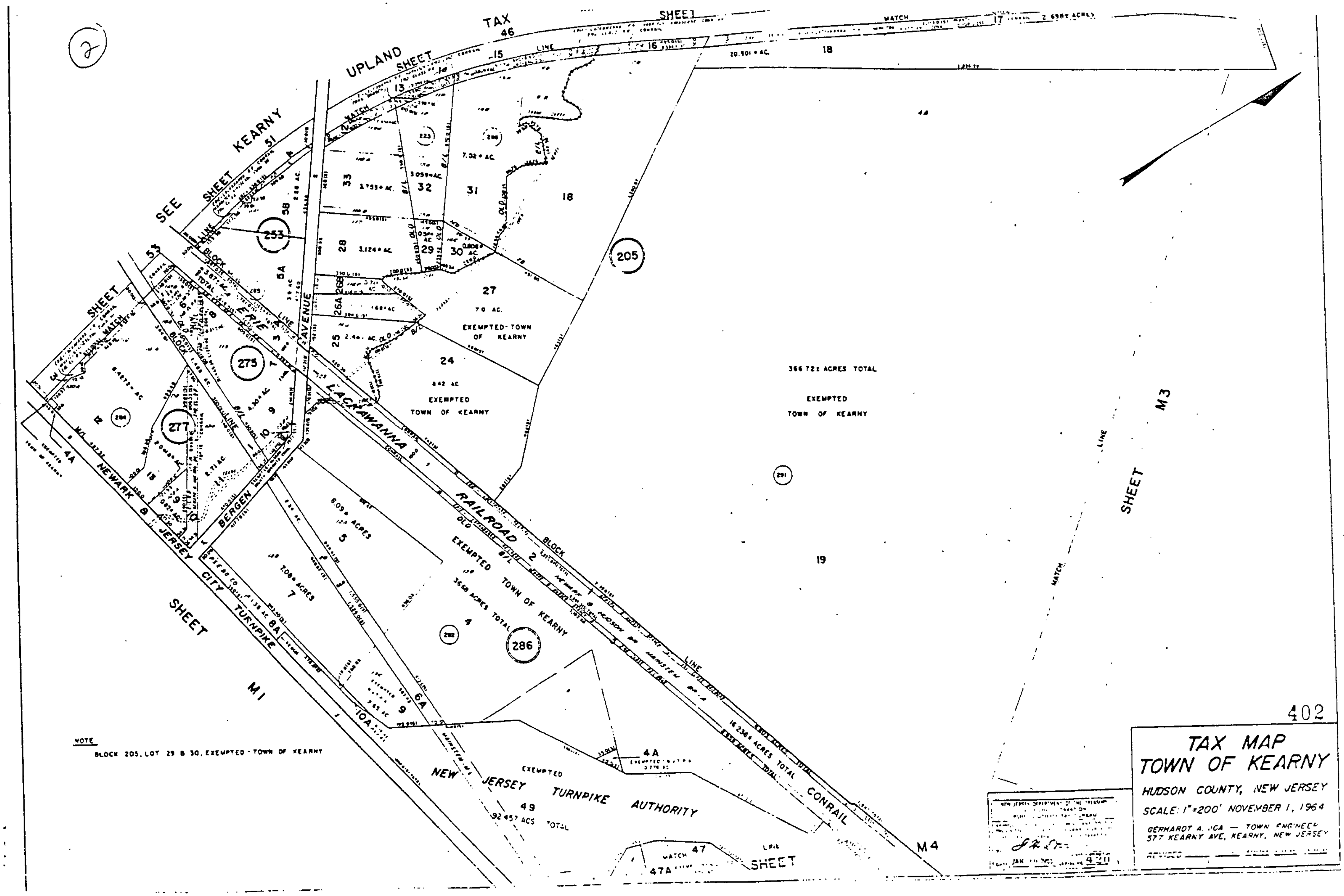
M2
SHEET
MATCH NEWARK JERSEY CITY (HARRISON AVE.) LINE
SHEET M4
N.J. TURNPIKE LINE
SEE KEARNY UPLAND TAX MAPS SHEET 55 SHEET 53
INTERSTATE ROUTE 280
EXEMPTED — TOWN OF KEARNY
285
284
160.918± ACRES
6.312 ACRES
2.50 AC.
5.5096 AC.
11.129± ACRES
19.286± AC.
BLOCK LINE
N.J. TURNPIKE AUTHORITY
NEW JERSEY TURNPIKE AUTHORITY
M7
SHEET
TOWN OF HARRISON HUDSON COUNTY
PASSAIC RIVER
CITY OF NEWARK ESSEX COUNTY
DATUM — U. S. COAST & GEODETIC PLUS 100.00 FEET
NEGLIA ENGINEERING ASSOCIATES
JOSEPH E. NEGLIA — TOWN ENGINEER
AUGUST 1970
MSLA ID LANDFILL
TAX MAP
TOWN OF KEARNY
HUDSON COUNTY, NEW JERSEY
SCALE: 1"=200' NOVEMBER 1, 1964
GERHARDT A. JOA — TOWN ENGINEER
577 KEARNY AVE, KEARNY, NEW JERSEY
REVISED

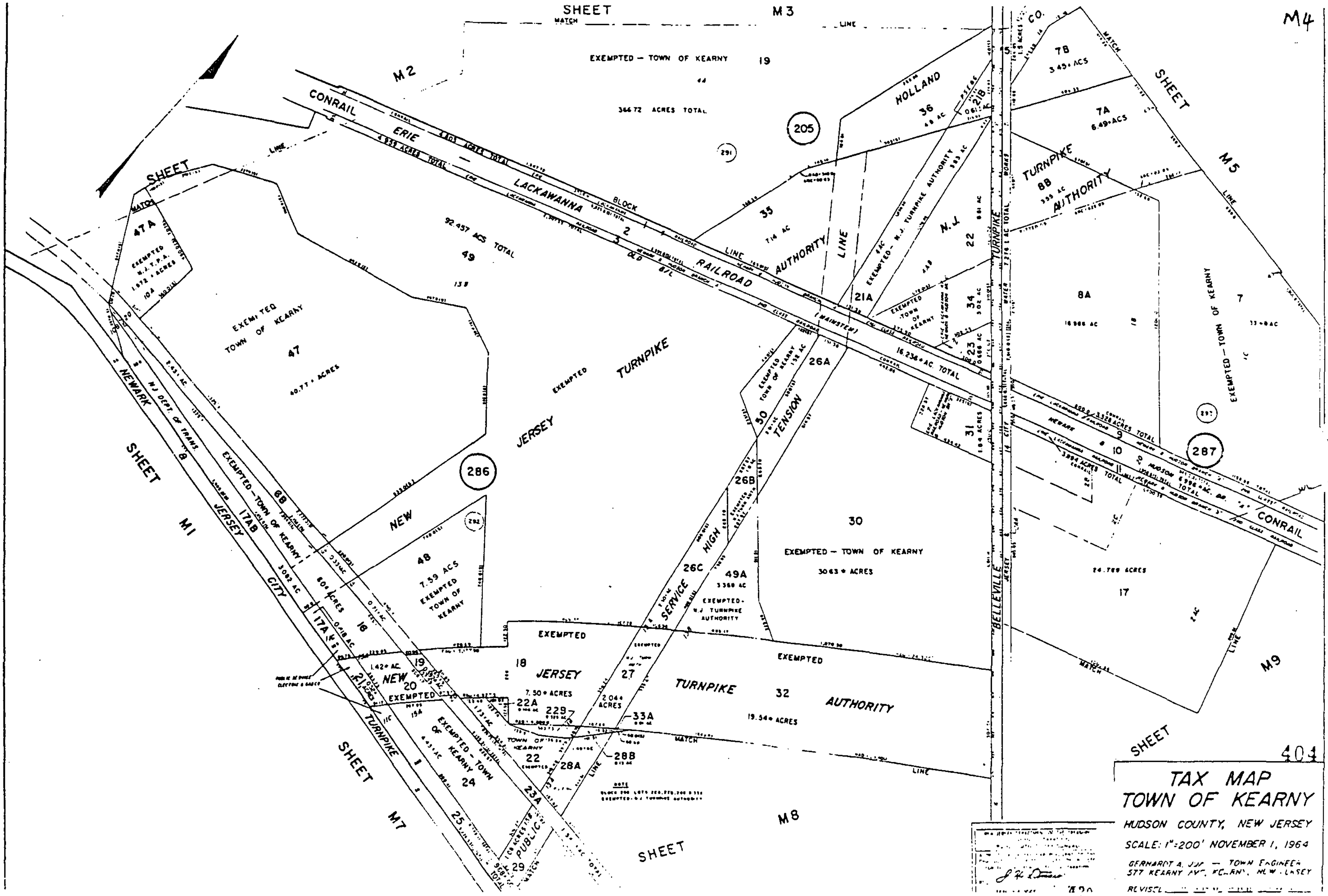
FIGURE 2

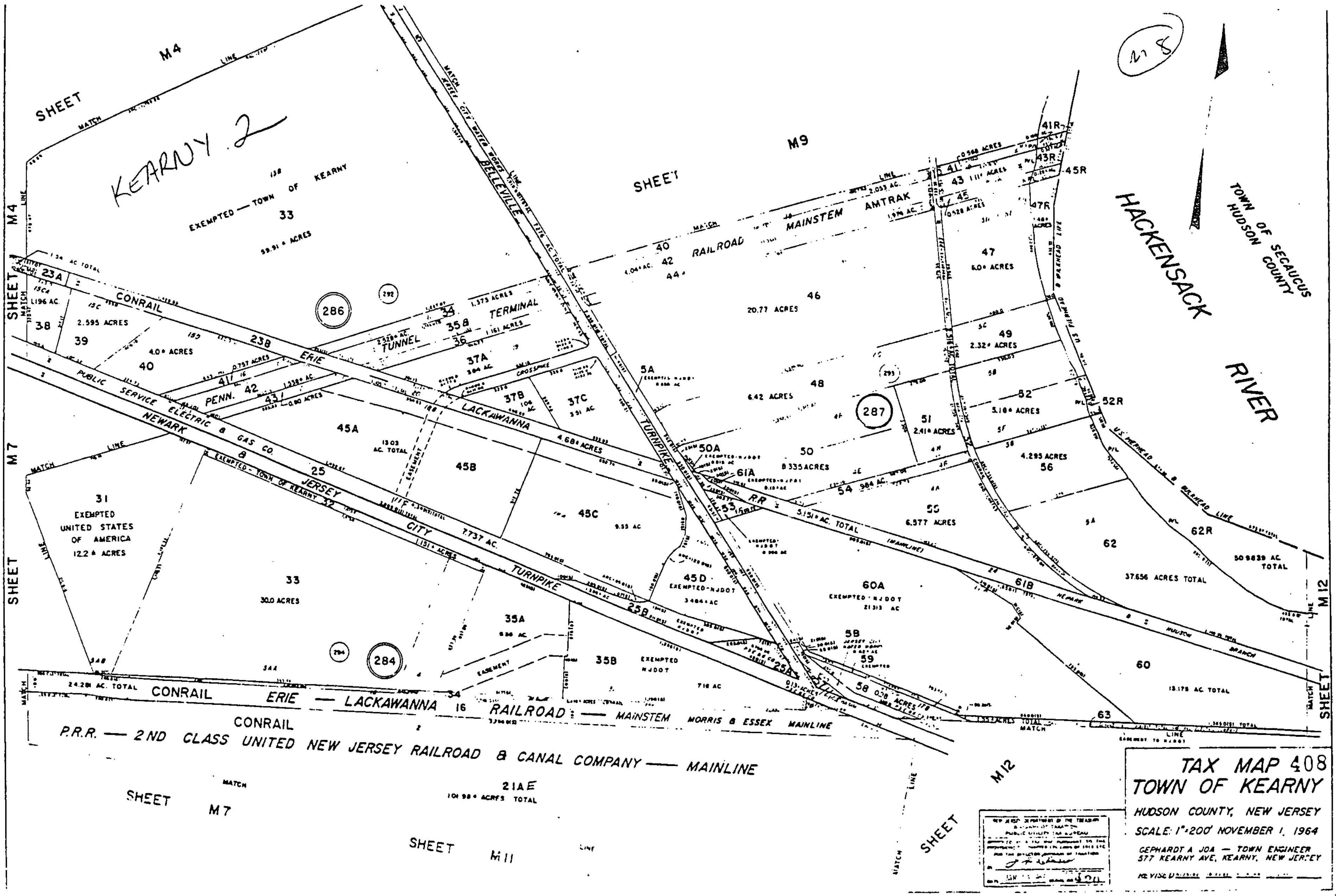


CITY OF NEWARK
ESSEX COUNTY
PASSAIC
RIVER
DETAIL "A"
JACOBUS AVENUE
GYPSUM STREET
SHEET M6
SHEET M4
SHEET M8
SHEET M11
M1
M7
CONRAIL
AMTRAK
ERIE - LACKAWANNA R.R.
PUBLIC SERVICE HIGH TENSION LINE
NEWARK & JERSEY CITY TURNPIKE
PENNSYLVANIA AVENUE
JACOBUS AVENUE
LINCOLN HIGHWAY
CONNECTING LINK
SECOND STREET
THIRD STREET
ADAMS STREET
CENTRAL AVE
TOWN OF KEARNY
EXEMPTED
38.16 ACRES TOTAL
13.279 ACRES
5.5 ACRES
15.86 ACRES
284
285
289
290
291
292
293
407
TAX MAP
TOWN OF KEARNY
HUDSON COUNTY, NEW JERSEY
SCALE 1"=200' NOVEMBER 1, 1964
GERHARDT A. JOA... TOWN ENGINEER
377 KEARNY AVE, KEARNY, NEW JERSEY

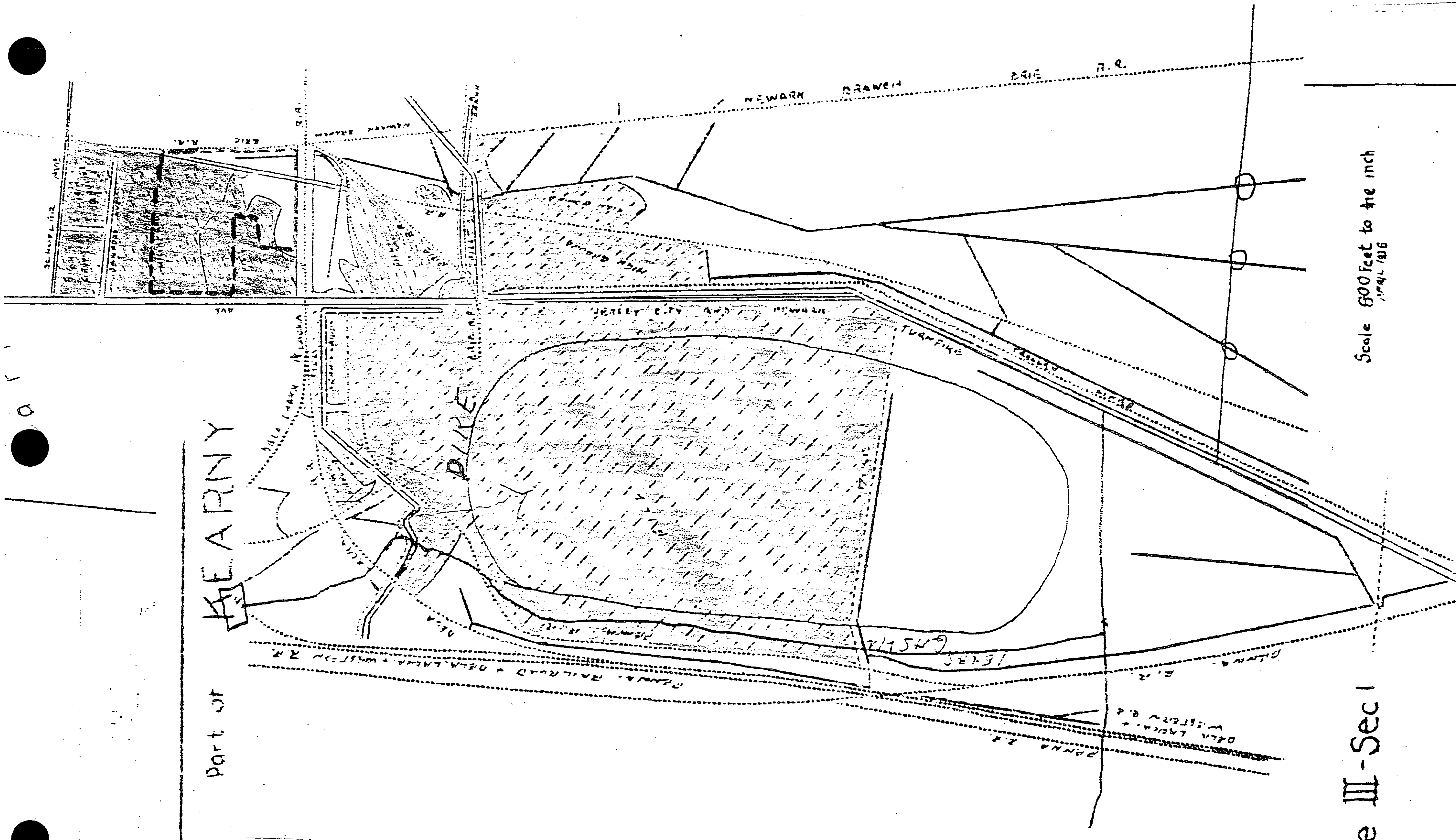
402


TAX MAP
TOWN OF KEARNY
HUDSON COUNTY, NEW JERSEY
SCALE: 1"=200' NOVEMBER 1, 1964
SEE SHEET KEARNY 51
UPLAND SHEET TAX 46
SHEET 53
SHEET M1
SHEET M3
SHEET M4
NEWARK & JERSEY CITY TURNPIKE
ERIE LACKAWANNA RAILROAD
CONRAIL
BERGEN AVENUE
NEW JERSEY TURNPIKE AUTHORITY
EXEMPTED TOWN OF KEARNY
366.72± ACRES TOTAL
EXEMPTED TOWN OF KEARNY
36.68 ACRES TOTAL
253
275
277
205
286
NOTE
BLOCK 205, LOT 29 & 30, EXEMPTED - TOWN OF KEARNY

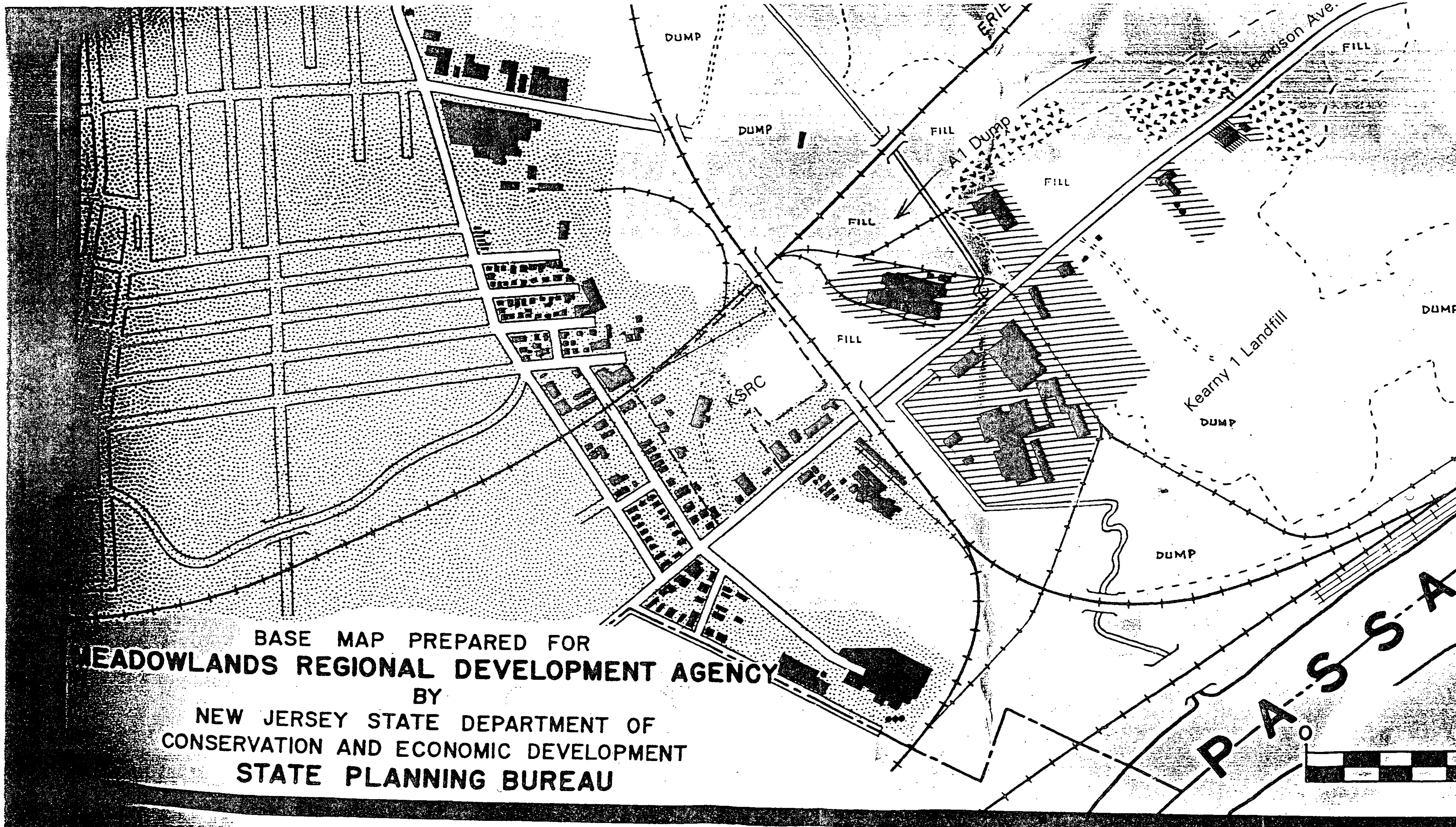

M4
SHEET M3
MATCH LINE
SHEET M2
EXEMPTED - TOWN OF KEARNY 19
36.72 ACRES TOTAL
205
CONRAIL
ERIE
LACKAWANNA
RAILROAD
BLOCK
LINE
HOLLAND
36
7B
3.49± ACS
7A
6.49± ACS
SHEET M5
TURNPIKE
8B
AUTHORITY
N.J.
22
35
AUTHORITY
LINE
21A
EXEMPTED - N.J. TURNPIKE AUTHORITY
8A
7
EXEMPTED - TOWN OF KEARNY
47A
EXEMPTED N.J.T.P.A.
92.457 ACS TOTAL
49
EXEMPTED TOWN OF KEARNY
47
40.77± ACRES
EXEMPTED
TURNPIKE
JERSEY
NEW
286
16.236± AC. TOTAL
26A
50
TENSION
31
287
CONRAIL
26B
30
EXEMPTED - TOWN OF KEARNY
30.63± ACRES
17
24.789 ACRES
SHEET M9
48
7.59 ACS
EXEMPTED TOWN OF KEARNY
26C
49A
3.369 AC
EXEMPTED - N.J. TURNPIKE AUTHORITY
SERVICE
HIGH
BELLEVILLE
TURNPIKE
SHEET M1
NEWARK
JERSEY
CITY
NJ DEPT. OF TRANS
EXEMPTED - TOWN OF KEARNY
17AB
6B
18
17A
EXEMPTED
18
JERSEY
7.50± ACRES
27
2.044 ACRES
TURNPIKE
32
19.54± ACRES
AUTHORITY
EXEMPTED
NEW
20
19
21
EXEMPTED
22A
229
33A
TOWN OF KEARNY
22
28A
28B
EXEMPTED - TOWN OF KEARNY
24
23A
25
29
PUBLIC
SHEET M7
SHEET M8
TURNPIKE
SHEET
404
TAX MAP
TOWN OF KEARNY
HUDSON COUNTY, NEW JERSEY
SCALE: 1"=200' NOVEMBER 1, 1964



TAX MAP 408
TOWN OF KEARNY
HUDSON COUNTY, NEW JERSEY
SCALE: 1"=200' NOVEMBER 1, 1964
GEPHARDT A JOA — TOWN ENGINEER
577 KEARNY AVE, KEARNY, NEW JERSEY



STUDY AREA COMPOSITE OF 1938 HCMEC WORK MAPS



FROM: COMPREHENSIVE REPORT 1960

APPENDIX "E"

ANALYSIS OF ALTERNATIVE SOLID WASTES MANAGEMENT SYSTEMS FOR THE HACKENSACK MEADOWLANDS DISTRICT

PREPARED FOR

THE HACKENSACK MEADOWLANDS DEVELOPMENT COMMISSION
STATE OF NEW JERSEY

PREPARED BY

ZURN ENVIRONMENTAL ENGINEERS

MAY 1970

Extensive railroad networks and major highways lace the Meadowlands as well as peripheral communities, and within the District, the Hackensack River and some of the creeks and canals are navigable. These transportation links make possible a wide range of alternative solid wastes management systems, including transfer from the Meadowlands for disposal elsewhere.

SOLID WASTES LOADINGS

General Considerations

The Hackensack Meadowlands Reclamation and Development Act requires the Commission to provide for the disposal of at least the quantity of solid wastes which the Meadowlands District was receiving from New Jersey sources in 1969. However, the Commission may provide for greater amounts. In this regard consideration must be given to existing source communities, the establishment of alternative disposal facilities in other areas, and increased amounts of solid wastes from source communities due to greater per capita rates of generation and expanding population densities.

In late 1968 the New Jersey Department of Health, on behalf of the Commission, conducted a survey of types, amounts, and sources of solid wastes delivered to the disposal sites in the District. The data from the survey have been utilized for most of the projections included in this report.

Present Solid Wastes Loadings

The Department of Health survey of solid wastes disposal operations in the Meadowlands District found that eleven active landfill operations handled a total of 29,469 tons per week. New Jersey sources contributed 25,642 tons per week, and the remainder, 3,826 tons per week, came from out-of-state sources. The results of this study indicate that most of the out-of-state wastes came from the New York City area.

Only about one-third of the total solid wastes loading, or 10,621 tons per week, consisted of domestic wastes. Industrial wastes made up another third, or 9,690 tons per week, and the remaining third was principally demolition debris (6,711 tons per week) with commercial wastes amounting to only 2,468 tons per week, or less than one-tenth of the total.

The survey data also show that 83 percent of the waste materials from New Jersey originated within five miles of the District. Interviews conducted in this study indicate that although some modifications of existing disposal operations have taken place, it appears that the total quantity of solid wastes entering the Meadowlands has not been significantly altered.

Eighty-four percent of the solid wastes generated within five miles of the District are disposed of in the District in this zone. Only the Cities of Newark, Jersey City, and Bayonne dispose of significant quantities of solid wastes at sites outside the District.

<u>Potential Solid Wastes Loadings</u>

The two most important factors relative to future solid waste disposal in the Meadowlands are:

(1) The total quantity of solid wastes generated in the areas peripheral to the Meadowlands, and

(2) The availability of alternative disposal facilities outside the Meadowlands District.

The per capita generation factors in the area of concern range from about 3.0 to 4.5 pounds per capita per day (pcd), which is significantly below the national average of approximately 5.5 pcd. However, these factors are expected to increase significantly over the next few decades. In addition it is estimated that the contributory area population will increase at a rate of nearly one percent per year. These two factors indicate that the quantities of solid wastes generated in the areas in and peripheral to the Meadowlands District will increase at a rate of about three percent per year.

Planning for multi-city disposal facilities in the vicinity of the Meadowlands has commenced in several areas. The Quad City project involves Paterson, Passaic, Wayne and Clifton. These communities which generate about 75 percent of Passaic County's wastes, are planning a centrally located incinerator. The Municipalities of Bloomfield, Cedar Grove, East Orange, Glen Ridge, Montclair, Orange, and Verona have formed <u>Joint Meeting Number One for Solid Wastes Disposal</u> for planning mutual disposal facilities. Jersey City handles about 1,500 tons per week in its incinerator, and Bayonne operates its own landfill. Neither city has planned modifications of the program.

It is estimated that there presently exists a maximum in-state potential solid wastes loading to the District of about 34,500 tons per week. This figure would be reduced if construction of additional alternative disposal facilities were implemented.

SOLID WASTES DISPOSAL OPERATIONS

Past Operations

Completed landfills in the District occupy about 1,500 acres, of which about 375 acres have been subsequently developed for other purposes. Most of these past disposal operations were characterized by "dump and push" techniques followed by open burning of the deposited refuse. Although very little compaction of the refuse was achieved in the placement operation, burning reduced subsequent stabilization problems by virtue of destroying putrescible materials.

Most of the development atop these old sites has been of a commercial or warehouse nature, and it has been concentrated along N.J. Route #3 and #20. Although detailed inspections were not made, it does not appear that the structures have suffered significant damage from differential settlement, as has been noted in other areas.

Existing Operations

There were, at the time of the Health Department survey, 11 active solid wastes landfill operations in the Meadowlands. Two were publicly operated: the Rutherford site (since closed) and Kearny V. In the intervening period the Lyndhurst II site has been opened.

In 1968 ongoing landfills covered a total area of 1,170 acres, of which 940 acres were active (not having received a final cover of earth). No significant use has been made of completed portions of these operations. Surveys conducted in this study indicate that:

(1) Sites are not equipped with all weather access roads, making travel difficult in wet weather.

(2) Where the dump sites are in tidal zones, the refuse is routinely deposited directly into the water.

(3) Dumping the material on the landfill surface and pushing the material over the edge are still predominant practices at most sites, and operators do not maintain a working area of a manageable size or operate on a sloped working face. Very little compaction is gained from these operational techniques.

(4) The cover material is generally the meadow mat, and when other material is used, it is usually not adequate relative to contemporary standards. Daily covering is seldom practiced.

(5) Although most operations prohibit the disposal of chemicals and other flammable wastes, little attempt is made to segregate the various classes of wastes into specific areas.

Remaining Capacities

The estimated total remaining capacity of active landfills in the Meadowlands is approximately 16 million tons. Thus, without increasing the areal extent of any of the landfills or opening new sites, solid wastes could continue to be disposed of by this method for an additional period of 7½ to 10 years, if good operational practices were instituted. This remaining capacity can provide the Commission with more than adequate latitude and flexibility in the implementation of the Commission-managed facilities. It should be reemphasized, however, that operational regulation of existing landfills will be mandatory in order to achieve the required environmental quality conditions and to assure a smooth transition to a system of Commission-managed facilities.

ALTERNATIVE SOLID WASTES DISPOSAL METHODS

Objectives and Evaluation

In the development of alternative solid wastes management systems for the Meadowlands District several alternative disposal methods were considered. Each was formulated within the specifications of the objectives of the generalized management system. These objectives are:

(1) To provide disposal capacity for a given minimum quantity of solid wastes;

(2) To provide for compatibility between solid wastes disposal activities and the planned development of the Meadowlands; and

(3) To maintain consistency with the nature and needs of solid wastes management systems developed by the New Jersey State Department of Health for areas adjacent to, peripheral to, or including the Meadowlands.

In order to objectively evaluate the alternative disposal methods, a set of bases for evaluation were developed. These included economic acceptability, flexibility, consistency with the Master Plan, environmental quality, and political and public acceptability.

TABLE IV-1

SUMMARY OF SOLID WASTE LANDFILLING
IN THE MEADOWLANDS - 1968

LANDFILL OPERATION*	SOLID WASTES - TONS PER WEEK				
	DOMESTIC	INDUSTRIAL	COMMERCIAL	DEMOLITION	TOTAL
Kearny I	411	805	92	1,707	3,015
Kearny II	1,105	1,528	586	2,192	5,411
Kearny III	375	494	39	89	997
Kearny IV	1,669	1,273	541	208	3,691
Kearny V	1,659	11	1	16	1,687
North Arlington I	806	404	46	17	1,273
North Arlington II	450	649	60	771	1,930
Lyndhurst I	1,571	2,642	99	94	4,406
Rutherford I	1,654	785	353	130	2,922
Secaucus	882	1,099	651	823	3,455
Little Ferry	39	-	-	664	703
TOTALS	10,621	9,690	2,468	6,711	29,490

Data from New Jersey Department of Health survey

* Locations of Landfills shown on Figure V-I.

TABLE V-1

COMPLETED LANDFILLS IN THE MEADOWLANDS DISTRICT

SITE	SIZE-ACRES TOTAL	DEVELOPED	UNDEVELOPED	CHARACTERISTICS
SECTION A				
A1	135	0	135	15'-30' of unburned refuse.
SECTION B				
B1	30	5	25	10'-20' of semi-burned and burned refuse. Approximately 30 acres are presently covered with junked automobiles.
B2	50	0	50	
B3	60	0	60	
B4	40	0	40	
B5	30	0	30	
SECTION C				
C1	70	0	70	10'-15' of burned refuse.
C2	25	0	25	
C3	125	0	125	
SECTION D				
D1	40	20	20	10'-20' of burned refuse.
D2	50	15	35	
D3	25	20	5	
D4	70	5	65	
D5	25	5	20	
D6	75	25	50	
SECTION E				
E1	150	10	140	10' -20' of burned refuse; a portion of the fill is now a highway interchange
E2	15	5	10	
E3	0	0	0	

TABLE V-1 (Cont'd)

COMPLETED LANDFILLS IN THE MEADOWLANDS DISTRICT

SITE	SIZE-ACRES TOTAL	DEVELOPED	UNDEVELOPED	CHARACTERISTICS
SECTION F				
F1	5	5	0	10'-15' of burned refuse; most areas have been closed since 1962 or before and have been used for construction.
F2	7	4	3	
F3	5	2	3	
F4	6	3	3	
F5	15	5	10	
F6	10	2	8	
F7	10	0	10	
SECTION G				
G1	85	20	65	10' of burned refuse; most operations completed by 1960.
G2	10	10	0	
G3	10	10	0	
G4	15	15	0	
G5	7	5	2	
G6	8	6	2	
G7	10	5	5	
G8	10	2	8	
SECTION H				
H1	15	0	15	10' of semi-burned refuse.
H2	45	5	40	
H3	5	0	5	
H4	5	3	2	
SECTION I				
I1	95	80	15	10' of burned refuse; these areas are highly developed.
I2	90	80	10	
TOTAL	1,483	372	1,111	

privately operated.

Several general statements can be made on the characteristics of these operations:

(1) Sites are not equipped with all weather access roads, making travel difficult in wet weather.

(2) Where the dump sites are in tidal zones, the refuse is routinely deposited directly into the water.

(3) Dumping the material on the landfill surface and pushing the material over the edge are still predominant practices at most sites, and operators do not maintain a working area of a manageable size or operate on a sloped working face.

(4) Very little compaction is gained from these operational techniques.

(5) The cover material is generally the meadow mat, and when other material is used, it is usually not adequate relative to contemporary standards.

(6) Daily covering is seldom practiced.

(7) Although most operations prohibit the disposal of chemicals and other flammable wastes, little attempt is made to segregate the wastes (municipal, commercial, demolition, industrial) to specific areas.

The degree to which the above deficiencies existed at each site varied; however, the deficiencies were noted to some extent at all of the existing operations.

Specific Characteristics

Although the characteristics discussed above generally describe operations within the Meadowlands, the specific characteristics of each site discussed below are presented to assist the commission in effecting improvement in the operations. A summary of the site characteristics is presented in Table V-2.

Kearny I: The operation consists of approximately 180 acres. Of this 180 acres, approximately 105 acres are actively used as area. The remaining 75 acres has been used as a disposal area, but substantial vegetation has already taken root on the reclaimed land. As of 1968 this operation was accepting about 3,000 tons of refuse per week from 29 communities.

The operation had four bulldozers on the site. One drag line was available for excavating meadow mat, the predominant cover material. The operator was attempting to provide a sloped working face on a portion of the active area, but the working area was not well controlled to provide a well defined, sloped working face. The abandoned, or inactive area, was dotted with recent deposits of large drums and other debris. Considerable areas of oil or chemicals were noted near these deposits.

Kearny II: Although the proprietor is only in his second year of operation at this site, this operation already consists of approximately 45 acres. In 1968 this site accepted about 5,400 tons per week of solid wastes from 33 different communities.

The operation had three bulldozers at the site and one drag line available for excavating meadow mat. The operation had a poorly defined working face and refuse was deposited directly into the water. The recently finished areas, as well as the active areas, were very poorly covered.

Kearny III: This operation covers approximately 80 acres. In 1968 it accepted about 1000 tons of refuse per week from 15 communities. Through 1969, however, the solid waste loading diminished considerably from the previous year; and it is understood that operations ceased in late Autumn 1969.

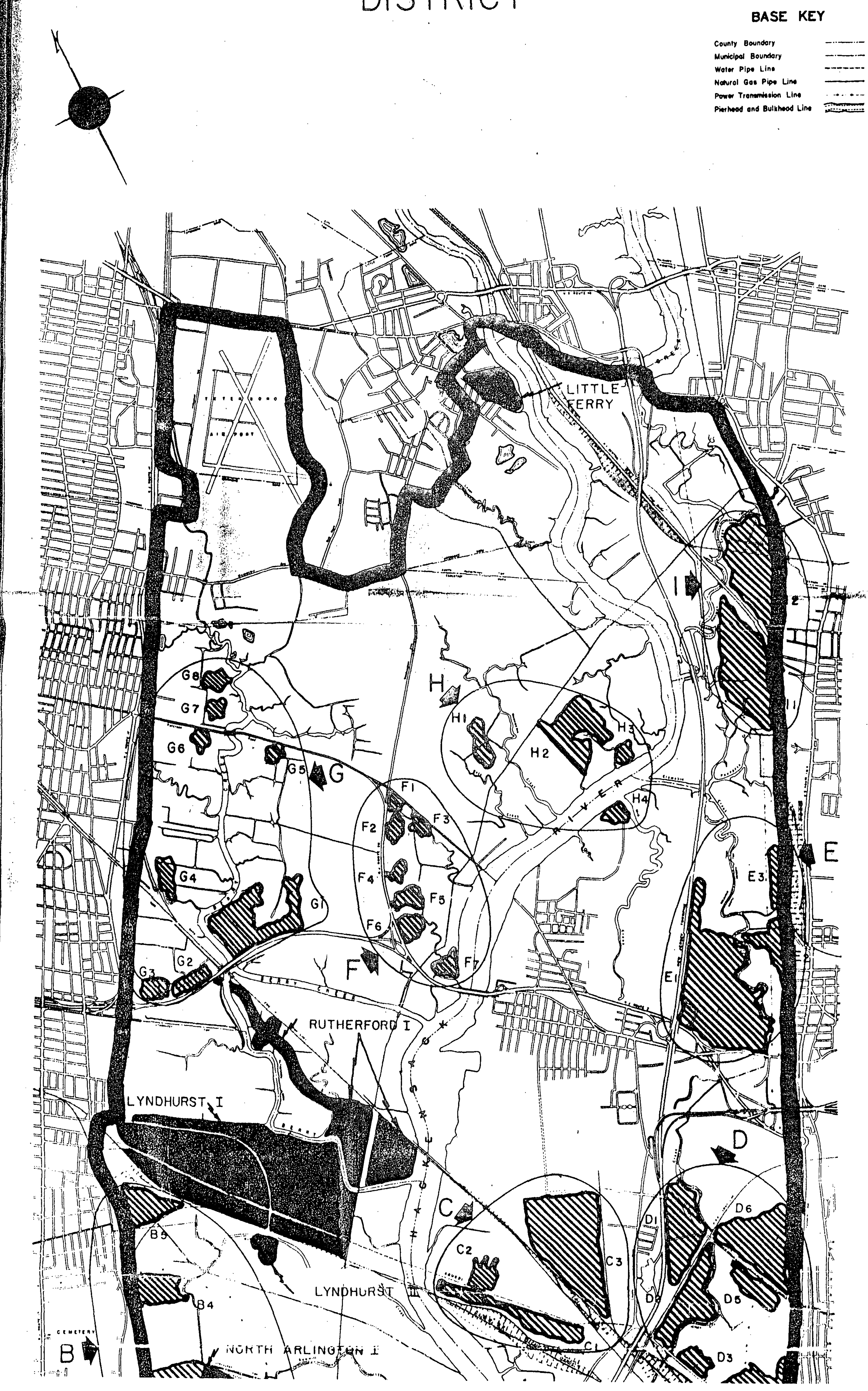
Inadequate compaction and covering practices were observed at the site.

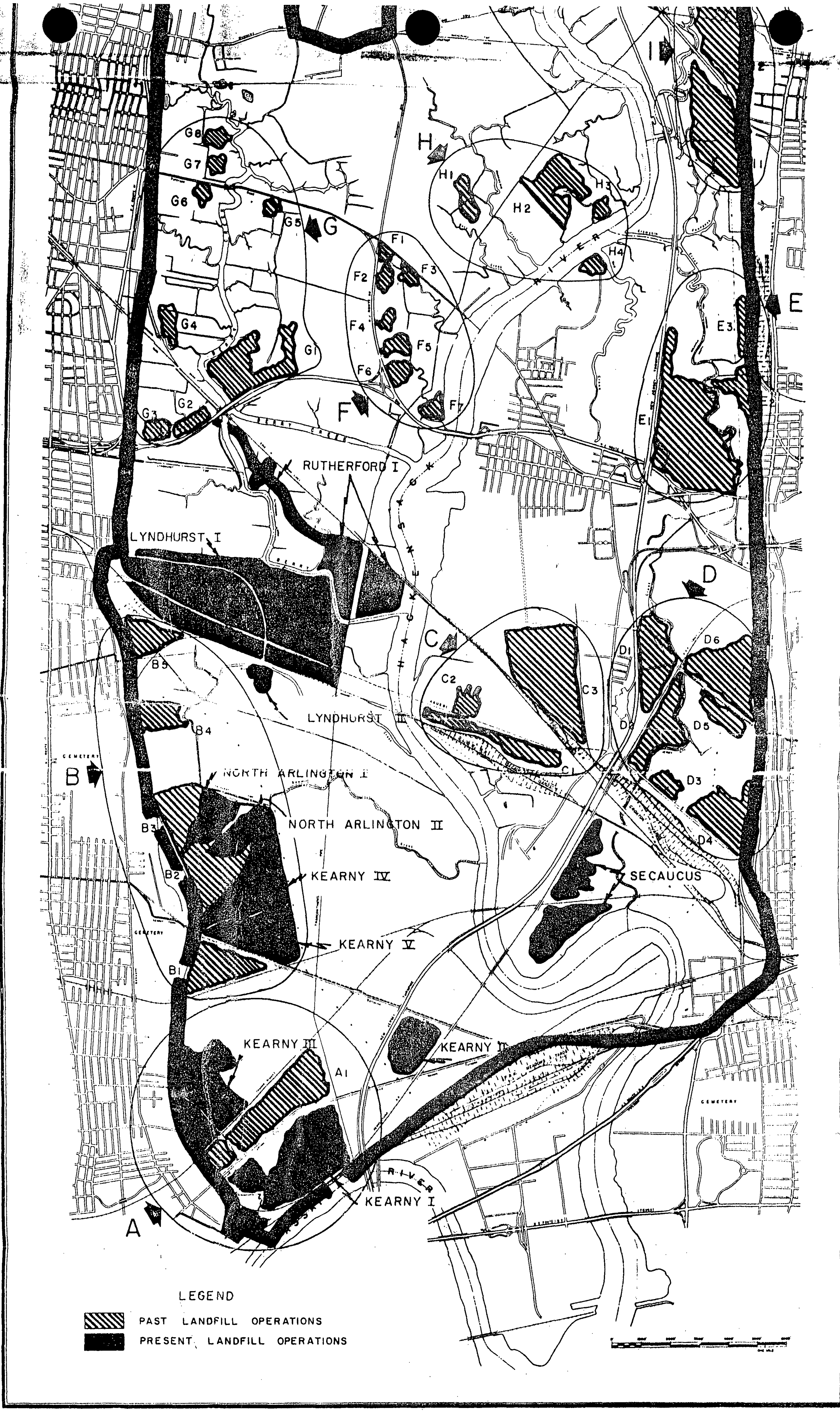
Kearny IV: This site covers approximately 110 acres. In 1968 it accepted about 3,700 tons of refuse per week from 42 communities.

Four bulldozers were available at the site. It appeared to be one of the largest operations in the Meadowlands and had a very extensive and indefinite working face. The operation was very scattered, and the refuse was only pushed about, with little compaction resulting. Covering operations were inadequate.

Kearny V: One of the three public operations in the Meadowlands, this operation accepted 1,700 tons per week of solid wastes in 1968, all of which were generated in the City of Newark. The operation included

HACKENSACK MEADOWLANDS DISTRICT





G8
G7
G6
G5
G
G4
G1
G2
G3
F1
F2
F3
F4
F5
F6
F7
F
H
H1
H2
H3
H4
RIVER
I
I1
E
E3
E1
RUTHERFORD I
LYNDHURST I
HACKENSACK
D
D1
D6
D2
D5
D3
D4
C
C2
C3
C1
LYNDHURST II
B5
B4
B
NORTH ARLINGTON I
NORTH ARLINGTON II
B3
B2
B1
KEARNY IV
SECAUCUS
KEARNY V
KEARNY III
KEARNY II
A1
RIVER
KEARNY I
A
CEMETERY
LEGEND
PAST LANDFILL OPERATIONS
PRESENT LANDFILL OPERATIONS

FIGURE V-1

3.2 Organic Ligand Analysis

Three groupings of the leachates on the basis of carboxylic acid content are evident in the data (Table 2). The first is those samples with predominantly short chain aliphatic (FL, NJ, TX) carboxylic acids. The second group of samples contain primarily aromatic acids and/or cyclohexane carboxylic acid (WI, OR). The third observed type, the Utah sample, has very low concentrations of organic, primarily aromatic, acids. This sample could be considered an end member of the second type (WI, OR). We have not found any short chain aliphatic acids in this sample, but are not convinced of their absence because Utah leachate has consistently posed extraction efficiency problems. The sample forms strong emulsions with both dichloromethane and MTBE. These emulsions could be the result of humic-like organic material in the sample or other, at present undetermined, matrix effects in this sulfide-rich sample.

The organic acids present in the leachates analyzed in this study are not dissimilar to acids identified in English landfill leachates [47], Canadian landfill leachates [48] or in U.S. landfill leachates [49,12]. The concentrations measured in the samples of this study, however, often vary considerably from previously reported values.

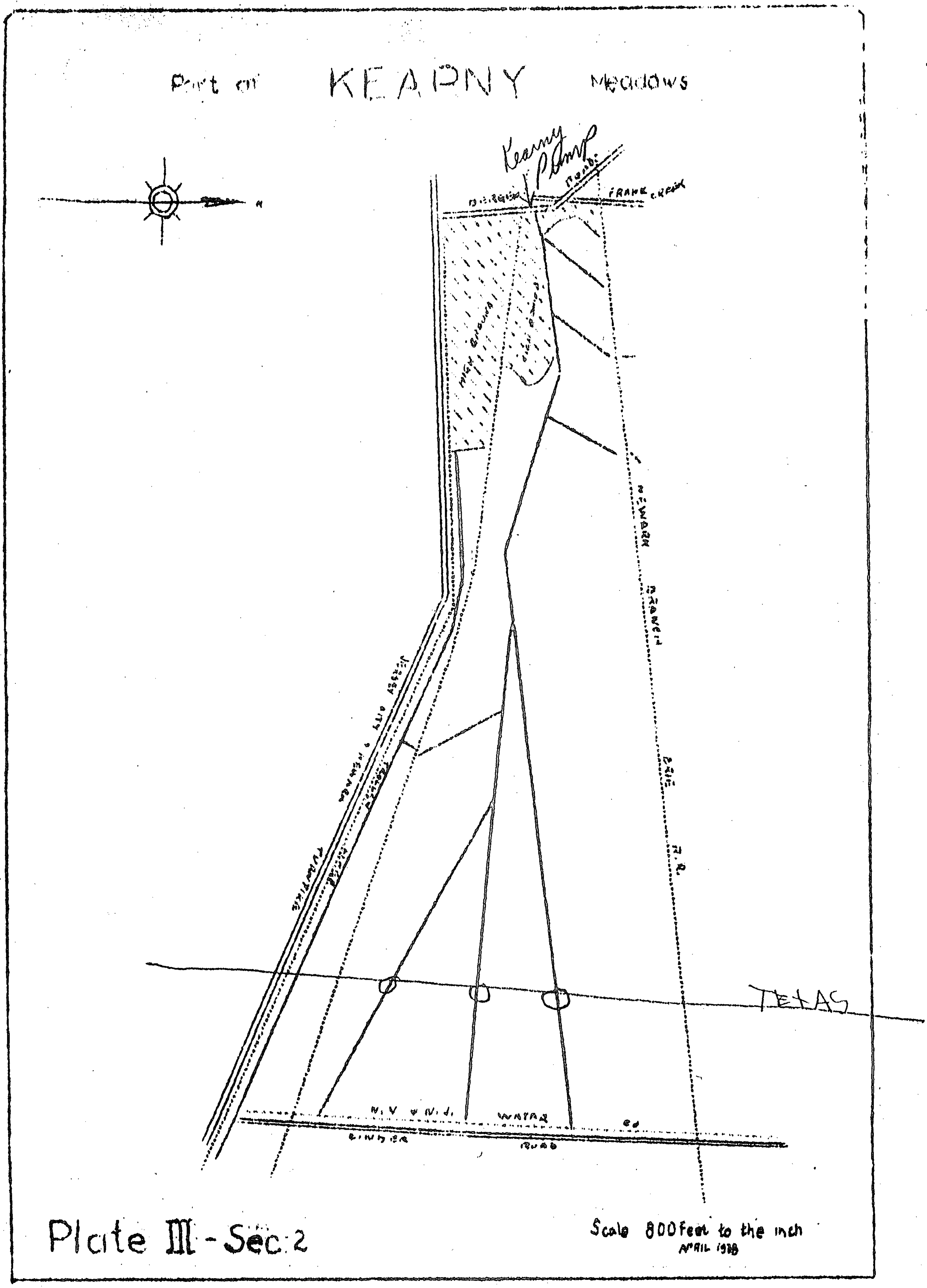
The presence and concentration, if present, of 1,2 or 1,3 or 1,4 benzene dicarboxylic acids is one example of this type of variability (Table 2). The Oregon and Wisconsin samples have very high concentrations of the 1,2 acid but no detectable concentrations of the 1,3 and 1,4 benzenedicarboxylic acids were present in the Oregon sample, while the Wisconsin sample has moderately high concentrations of the other two isomeric acids. The Texas and Florida samples have slightly lower concentrations of the 1,2 acid and, again, only one of the two (TX) has the 1,3 and 1,4 acids present. The Utah sample only contains low levels of the 1,2 acid and none of the these acids were present in the New Jersey sample.

TABLE 2. *Organic Ligands in Landfill Leachates.* P = Present, but concentration not quantified

	Concentration Found (mg/L)					
	UT	*NJ*	*FL*	*WI*	*OR*	*TX*
Carboxylic Acids:						
Acetic	P	P	P	P	P	P
Propanoic	23.80	4.09			1.13	22.69
Methylpropanoic	3.70	2.08			P	1.23
Butanoic	7.07	0.19			P	0.39
Dimethylpropanoic				0.02		
3-Methylbutanoic		3.06	1.35			4.65
Pentanoic		1.71	0.01	P		0.12
Methyl butanedioic						P
3,3-Dimethylbutanoic			0.01	P		
2,3-Dimethylbutanoic		P	0.01	P		
2-Methylpentanoic		0.17	0.04			0.11
3-Methylpentanoic		0.02	0.01	0.02		
4-Methylpentanoic		0.17	0.02			0.47
Hexanoic		0.06	0.01	P		0.01
2-Ethylbutanoic			0.04			0.07
4-Methylhexanoic		0.08				0.10
5-Methylhexanoic		0.03	P			
Heptanoic		0.70	1.16	0.49		0.55
2-Ethylpentanoic				0.03		0.01
Cyclohexane Carboxylic		0.11	0.03	5.85		0.76
3-Cyclohexene Carboxylic				0.03		
3-Cyclohexene-1,2-dicarboxylic				0.02		0.03
2-Ethylhexanoic		0.08	P	0.20		0.19
Palmitic	0.16			0.10		
Benzoic	P	0.05	0.09	0.02	0.49	1.37
Phenylacetic	P	0.03	0.41	10.54	1.41	1.38
Toluic	P		0.04	0.12		0.06
Phenylpropanoic				0.13		0.08
alpha-oxophenylpropanoic	0.13		0.22		0.22	0.08
1,2-Benzenedicarboxylic	0.06		0.95	4.40	5.37	0.90
1,3-Benzenedicarboxylic				2.04		0.43
1,4-Benzenedicarboxylic				1.22		0.25
Phenylbutanoic				0.06		
2-[4-Chloro-o-tolyloxy]propanoic				P		P
Phenols						
Phenol					P	
Cresol			P	P	P	P
3-Ethylphenol				P		
4-t-Butyl phenol	P	P	P			

C2. A1 Dump and Component Sites

A1 Dump



REPORT

Date ____________

BREEDING: ____________ Sheet ____________ Ditch ____________ Holes ____________

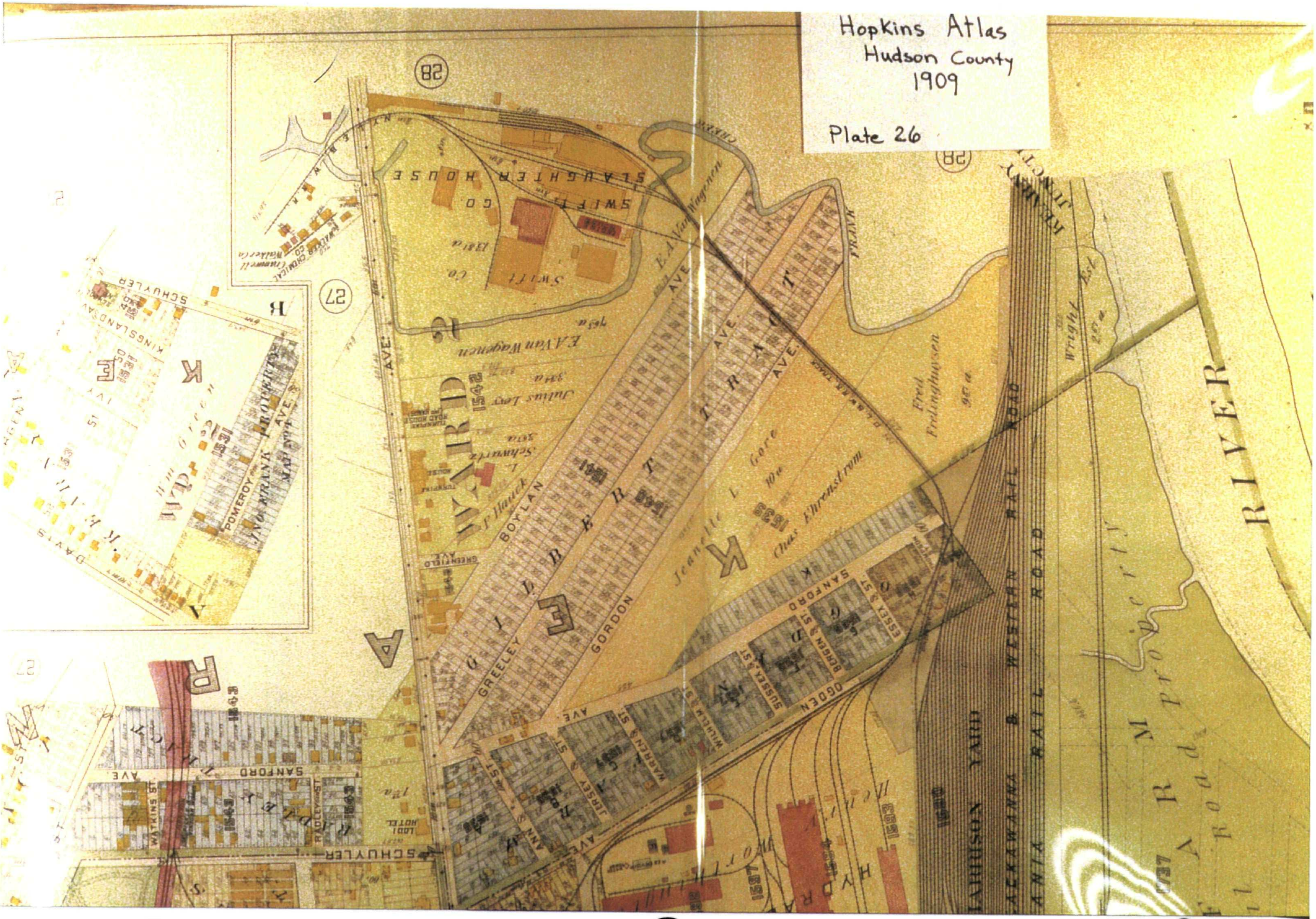
DEG: L.____ M.____ H.____ STAGE: E.____ M.____ A.____ P.____

DISPOSITION OF BREEDING: ____________

OIL USED: ____________

Hopkins Atlas
Hudson County
1909

Plate 26



PLAT BOOK OF HUDSON COUNTY, NJ
VOL. 2, G.M. HOPKINS CO., 1923, PLATE 32

REMEDIAL INVESTIGATION REPORT
HARRISON AVENUE LANDFILL
LOT 4 BLOCK 286, KEARNY, NJ

Prepared by Envirotech Consultants, Inc.
For
Hartz Mountain Industries, Inc.

Volume 1 of 5

June 1998

ENVIROTECH CONSULTANTS, INC.

ENVIROTECH Consultants, Inc.

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TEL (201) 882-1300
FAX (201) 882-4942

NJDEP UST Firm Cert. No. US00116
NJDEP -Approved Hazardous Waste Cleanup Organization
NJDEP UST Individual Cert. Nos. 0009720, 0009947, 0010034

UNDERGROUND STORAGE TANKS
ENVIRONMENTAL STUDIES
SITE REMEDIATION

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Table 1.
Summary Table of Work Conducted
Harrison Avenue Landfill

Date of Work	Company	Type of Work Performed	Sampling Performed	Report Generated	Comments/ Significant Findings
12/88	TAMS	Wetlands delineation, profile of historical site use & contamination	None	"Pre-purchase Site Investigation Report..." (1988)	Wetlands identified on portions of the site. Historical illegal dumping documented.
12/88	Cortell/ITC	14 soil borings, initial soil sampling & analysis	14 soil borings, 2 samples per boring	"Environmental Evaluation, Kearny Landfill Site" (Cortell, 1991)	5 metals above NJDEP NRDCSCC; 24 samples analyzed for TPH all had TPH, only B-4 exceeded NRDCSCC, none over HWL; 8 samples contained PCBs above NRDCSCC, only B-4 exceeded HWL; No VOs over NRDCSCC, and only 1 sample with BNs above NRDCSCC.
1/89	Melick-Tully	14 Geotechnical borings to depths exceeding 100'	No samples analyzed in lab	Detailed boring logs submitted to Hartz (5/89)	Same boring locations as Cortell/ITC (1988), but deeper (exceeding 100'); valuable information obtained for underlying aquifers and formations.
5/91	Cortell/ITC	Sampling at 10 test pits and 8 soil borings; 8 borings converted to monitoring wells (B-1 through B-28) & ground water was sampled	1 sample from each test pit; 2 samples from each boring; 8 monitoring wells sampled	"Environmental Evaluation, Kearny Landfill Site" (Cortell, 1991)	15 samples with metals (primarily lead & zinc) over NRDCSCC; 5 samples with TPHs over NRDCSCC, 2 exceeded HWL; 12 samples with PCBs over NRDCSCC but none over HWL. Numerous compounds exceeded GWQS.
9/95	Envirotech	12 test pits/soil sampling	2 samples from each test pit	"Summary of Kearny Landfill Soil Sampling Activities" (10/95)	TPH, PCB, & RCRA parameters sampling; only E6-B (9') exceeded RCRA limit (also NRDCSCC); 5 samples for PCBs exceeded NRDCSCC none exceeded HWL.
1995-1996	Sadat Assoc.	19 test pits in 12/95; 3 "deep" monitoring wells installed (D-1, D-2, D-3), ground water sampling; well search; soil gas survey from 26 shallow boreholes	16 TPH & 3 PCB samples from test pits; sampled 3 new and 7 previous wells (monitoring well B-25 destroyed).	"Draft Remedial Investigation Report for the Harrison Avenue Land Fill" (6/96)	Delineated around previous PCB areas-no PCBs detected over NRDCSCC; delineated around previous TPH areas-only TPH-7, TPH-8, & TPH-13 exceeded NRDCSCC but were below HWL except TPH-8(9') which exceeded HWL; several metals exceeded GWQS, elevated VOs and TPHs were detected; ammonia-nitrate & chlorides also exceeded GWQS: low levels of soil gas
8/97-2/98	B. Laing Assoc.	Wetlands delineation and characterization	Wetlands sampling	"Wetland Delineation, Harrison Avenue Property & the Hudson Avenue Right-of-Way" (2/98)	Four wetland sites & 2 major types identified. Flora listed.
2/98-5/98	Envirotech	10 wells installed; slug testing; well sampling; wetlands sampling; tidal study; 8 soil borings for peat delineation; 10 borings for free product delineation; updated well & contaminated sites search	17 wells sampled; 6 wetlands samples (3 water & 3 sediment); 4 TPH (boring) samples around MW-30	Letter-January 7, 1998 Letter- March 11, 1998 This report	Discussed in this report
1/98 & 5/98	Macdel Engineering	Wetlands surveyed; new survey (May) of test pits; old wells, and Envirotech borings/wells.		Tabulated results with NJ State Plane coordinates and elevations	Wetlands were delineated by B. Laing and surveyed by Macdel in January.

Notes:

For detailed information on previous reports refer to the accompanying text.
TPH = Total Petroleum Hydrocarbons
HWL = Hazardous Waste Level
GWQS = Ground Water Quality Standards
NRDCSCC = Non Residential Direct Contact Soil Cleanup Criteria
VOs = Volatile Organics
BNs = Base-Neutrals

feet at MW-29, MW-30, and MW-31, respectively. The data obtained by Envirotech and data from previous reports also indicate that the "deep" wells are screened in a confined aquifer. At the time of their investigation, Sadat had acknowledged the presence of the confining peat layer, but had erroneously considered the lower aquifer as an unconfined aquifer. Regionally, this aquifer may be considered as a semi-confined aquifer if it is found to be unconfined in other areas outside of the property lines (e.g., in non-landfill areas south and west of the site).

Envirotech proceeded to conduct a qualitative pump test at D-1, D-2, and D-3 by pumping from the lower aquifer and noting any water-level changes in the adjacent piezometers (MW-29, MW-30, and MW-31). Dye was placed in the piezometers as a tracer to determine if there is hydraulic connection via the "deep" well casings. Pumping was conducted using a high-capacity centrifugal pump or submersible pump for about one hour. No changes were noted on the water levels in the piezometers. Dye was not noted in the pumped water. This led to the conclusion that two aquifers exist and that the "deep" well casings are appropriately sealed within the upper aquifer (i.e., with no hydraulic connection between the upper and lower aquifers). It should be noted, however, that subsequent soil boring and well installation activities revealed that the confining layer between the two aquifers is only a few feet thick, and that in some places the confining layer between the two aquifers consists only of a thin (a few inches thick) layer of peat and/or clay lenses. Thus, leachate from the landfill is able to slowly migrate downwards through the confining layer and into the lower aquifer.

4.3 Slug Testing at Monitoring Wells

On February 26 and March 2, 1998, Envirotech conducted slug testing at the following wells: B-21, B-22, B-23, B-24, B-26, B-27, B-28, D-1, D-2, and D-3. The exceptions were at the 3 piezometers, B-25 (which was found to be damaged and filled to the top with debris), and the other wells that were installed at a later date. Slug testing was conducted in order to estimate the hydraulic conductivities of the upper and lower aquifers.

A slug of approximately 2.2 to 3.3 gallons was bailed out of each well and the time-displacement response was recorded using a Troll SP4000 (manufactured by In-Situ Inc.) pressure transducer-data logger. Time-displacement data was analyzed using the *AQTESOLV*[R] computer program. Two analytical methods were used: Bouwer-Rice (1976) for unconfined and unconfined aquifers, and Cooper-Bredehoeft-Papadopulos (1967) for confined aquifers. Time-displacement data, plots, input and output data are contained in Appendix E.6. The results are summarized in Table 2.

Table 2.
Summary of Slug Testing Results
Harrison Avenue Landfill

Well ID	Screened Interval (Elevation)	Peat/Clay Layer Elev.	Screened Aquifer	K (in ft/day)	K (in gpd/ft^2)	K (in cm/s)	Estimated Storativity
D-1	-14.5 to -24.5	Approx. -4.5	Lower	4.6 to 4.7	34.4 to 35.1	0.0016 to 0.0017	4.3×10^{-3}
D-2	-9.8 to -19.8	-2.8 to -4.8	Lower	3.2 to 6.3	23.9 to 47.1	0.001 to 0.002	1.7×10^{-6}
D-3	-12 to -22	-2 to -4	Lower	7.1 to 8.8	53.1 to 65.8	0.0025 to 0.003	1×10^{-10}
B-21	1.0 to -9.0	1.0 to -1.0	Lower	6.3 to 7.21	47 to 53.9	0.0022 to 0.0025	1.55×10^{-5}
B-22	5.7 to -4.3	-4.3 (?)	Upper	32.9	246	0.01	NA
B-23	4.8 to -5.2	-4.2 (?)	Upper	23.2	173.5	0.008	NA
B-24	2.5 to -7.5	-4 (?)	Upper/Lower*	11.3	84.5	0.004	NA
B-26	6.2 to -3.8	-3.8 (?)	Upper	46.7	349.2	0.016	NA
B-27	6.9 to -3.1	-2.6 (?)	Upper	52.4	391	0.018	NA
B-28	6.5 to -3.5	Not found	Upper	35.4	265	0.012	NA

Notes:

Upper aquifer is unconfined within refuse material above clay/peat layer; Lower (sandy) aquifer is confined, below clay/peat layer
Time-displacement response for wells B-22, and B-24 is not ideal using Bouwer-Rice Method
(?) indicates that peat/clay layer was not encountered since no samples were taken within the interval from 12 to 15 ft b.g. The given depth is the estimated bottom of refuse material or the general location of top of peat/clay layer.
* This well is screened in the upper aquifer and possibly partly within the lower aquifer
NA = Not estimated by the analytical method used (for unconfined aquifers)
Two values for wells screened in lower aquifer represent the range of results for both Bouwer-Rice and Cooper-Bredehoeft-Papadopulos methods

It can be noted that the values obtained for the lower aquifer range from 3.2 to 8.8 ft/day, with an average of 6.02 ft/day. These values are typical of silty sands and fine sands that were noted by Envirotech during soil boring and well installation activities on site. The hydraulic conductivity values obtained for the upper aquifer are distinctly higher, ranging from 23.2 to 52.4 ft/day and with an average of 38.1 ft/day. This indicates that there is good permeability in the upper (water-table) aquifer, as can be expected in uncompacted refuse and debris. (The lower value of 11.3 ft/day obtained from B-24 does not accurately represent the upper aquifer since the well appears to be screened in both the upper and lower aquifers.)

4.4 Wetlands Sampling

On April 8, 1998, Envirotech was on site to perform sediment and water sampling within the wetlands located along the northern property line. The objective of sampling was to determine the possible effect of the landfill's leachate and runoff on the adjacent wetlands. Three locations were sampled. Samples S-1 (sediment) and W-1 (water) were collected near the western portion of the property line. Samples S-2 and W-2 were collected near the north-central portion of the property line. Samples S-3 and W-3 were collected near the eastern portion of the property line. S-1, S-2, W-1, and W-2 were collected approximately 3-4 feet from the shoreline, while S-3 and W-3 were collected 8-10 feet from the shoreline. Water depths at the sampling points ranged from 6 to 10 inches. (See map in Appendix B.7 for plotted sample locations.) The sediments were noted to consist of mud with abundant organic material (decaying leaves) and approximately 10 percent sand and gravel. Only the mud portion was collected for laboratory analysis.

centrifugal pump. The PVC tops were then capped with gripper plugs and the standpipes were secured with padlocked lids.

Boring logs, well construction, casing/screen elevations, and other details are contained in Appendices E.2 and E.4. Additional data on depth to peat and confining layer is contained in Appendix E.3. A survey of the monitoring wells was conducted by Macdel Engineering in May 1998. The tabulated results showing elevations and NJ State Plane Coordinates are contained in Appendix E.7.

4.6 Well Sampling and Analytical Results

On April 15 and 16, 1998, all wells, except for the small (2 inch) -diameter piezometers (MW-29, MW-30, and MW-31) were sampled by Envirotech. Standard NJDEP protocols were followed for purging and sampling activities. As per N.J.A.C. 7:26E, field parameters such as pH, conductivity, dissolved oxygen, and temperature were obtained prior to purging, after purging, and after sampling. The "shallow" wells were purged using a low-flow peristaltic vacuum pump (with dedicated intake tubing at each well) while the "deep" wells were purged using a dedicated submersible pump. The pump and hose were field-decontaminated in-between wells using tap water and industrial-grade detergent (Alconox). A volume of water equivalent to three times the volume of standing water in the casing was evacuated from each well. The ground-water level was allowed to recover to within 2 feet of the static level prior to obtaining the samples. Samples were collected using dedicated, disposable polyethylene bailers and transferred into laboratory-provided sample jars. The sample jars were then labeled, placed in a cooler with ice packs (maintained at 4°C), then transported to the laboratory together with a Chain-of-Custody record.

All field measurements, purging/sampling information, and observations are contained in the Well Sampling Field Logs contained in Appendix J.2.

The ground-water samples obtained from all new wells (D-4, D-5, D-6, D-7, D-8, MW-32, and MW-33) were analyzed for Priority Pollutants (PP+40) and the following leachate parameters: ammonia, nitrate, nitrite, COD (Chemical Oxygen Demand), BOD (Biological Oxygen Demand), sulfates, TPH (Total Petroleum Hydrocarbons), oil/grease, TSS (Total Suspended Solids), TS (Total Solids), TOC (Total Organic Carbon), TKN (Total Kjeldehl Nitrogen), and pH. Analytical work was performed by W.A.T.E.R. Works Laboratory, Inc. (East Orange, NJ; NJDEP Lab ID 07673).

The ground-water samples obtained from the old wells (B-21, B-22, B-23, B-24, B-26, B-28, D-1, D-2, and D-3) were analyzed only for priority pollutant metals, volatile organics (VO+10), and the above-listed leachate parameters. These were based on the contaminants of concern that had been identified during previous ground-water sampling by Sadat.

Analytical methodology, Method Detection Limits, and other QA/QC indicators are contained in the laboratory data deliverables (in the NJDEP reduced format) that can be found in Appendix J.3. The analytical results are summarized in Table 8. Appendices B.9 through B.14 show the concentration isopleths for benzene, cadmium, and lead (the 3 most widespread compounds that exceed the GWQS) for the upper and lower aquifers.

Ammonia was found at elevated concentrations in 6 wells, namely B-23, B24, D-2, D-3, and D-8. Concentrations ranged from 510 parts per billion (ppb) in B-24 to 57,400 ppb in D-2. These concentrations exceed the NJDEP's cleanup standard of 500 ppb as per the Ground Water Quality Standards (N.J.A.C. 7:9-6). Due to elevated MDLs (1000 ppb), ammonia was not found but may actually exceed the 500 ppb GWQS in wells D-6 and D-7. Based on Sadat's sampling rounds in 1996, ammonia was found at elevated levels in the "shallow" wells at concentrations ranging form 8,300 ppb to 95,000 ppb and in the "deep" wells (D-1, D-2, D-3) at concentrations of 4,000 ppb to 31,700 ppb.

Acidic (pH of less than 6.5) conditions were noted in 6 wells, namely, D-2, D-3, D-5, D-7, IW-32, and MW-33. The following priority pollutant metals were found in at least one well: arsenic, beryllium, cadmium, chromium, copper, lead, nickel, and zinc. The following metals were not detected in any of the wells: antimony, mercury, selenium, silver, and thallium.

Cadmium and lead were detected in all the wells. Cadmium ranged from 1.61 to 12.82 ppb. In 15 (of the 17) wells, cadmium concentrations exceed the GWQS of 4 ppb. Lead ranged from 3.52 to 69.21 ppb. In 14 wells, lead concentrations exceed the GWQS of 10 ppb. The 1996 sampling rounds (performed by Sadat) also indicated the widespread occurrence of cadmium and lead in the upper and lower aquifers at concentrations exceeding the GWQS.

Arsenic was found in 5 wells at concentrations ranging from 6.3 to 43 ppb. Two wells, D-7 and MW-32, registered concentrations of 10.7 and 43 ppb, respectively, which exceed the GWQS of 8 ppb.

Beryllium was detected in 3 wells, but at low concentrations of 0.51 to 1.24 ppb which are well below the GWQS of 20 ppb.

Chromium was detected in 4 wells at concentrations ranging from 9.4 to 157.7 ppb. Two wells, MW-32 and MW-33, registered concentrations of 157.7 and 137.5 ppb, respectively, which exceed the GWQS of 100 ppb.

Copper was found in all wells, at concentrations ranging from 13 to 441 ppb, all of which are less then the GWQS of 1000 ppb.

Nickel was found in 15 wells at concentrations ranging from 18 to 455 ppb. In B-24, B-27, and MW-32, nickel was found at concentrations exceeding the GWQS of 100 ppb. The 1996 sampling rounds performed by Sadat also indicated that nickel was widespread in both aquifers and commonly occurred at concentrations exceeding the GWQS.

Table 8.
Results of Ground Water Sampling
PPMetals, VO+10, Landfill Leachate Parameters
Harrison Avenue Landfill

Sample ID	GWQS*	B-21	B-22	B-23	B-24	B-26	B-27	B-28	D-1	D-2
Lab ID		91966	91967	91968	91969	91970	91971	91972	91973	91994
Sample Matrix		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Date Collected		4-15-98	4-15-98	4-15-98	4-15-98	4-15-98	4-15-98	4-15-98	4-15-98	4-16-98
Leachate Parameters (ppb):										
Nitrate-Nitrogen	10,000	1130	1040	440	470	960	970	500	1,112	1190
Nitrite-Nitrogen	1000	27	24	<10	17	35	<10	<10	<3000	<10
Ammonia-Nitrogen	500	140	190	620	510	260	<100	410	230	57,400
COD		115,000	108,000	121,000	127,000	103,000	94,000	138,000	226,000	264,000
BOD		12,000	4000	16,000	12,000	12,000	14,000	24,000	<3000	15,000
Sulfates	250,000	16,200	84,050	24,700	33,700	68,900	34,300	12,400	37,700	39,700
Total Suspended Solids		114,000	5000	60,000	28,000	33,000	98,000	139,000	78,000	1,500,000
Total Solids		1,070,000	1,040,000	1,130,000	1,040,000	900,000	970,000	1,370,000	2,430,000	2,800,000
TPH		<300	<320	<300	<300	<310	<310	<310	<320	<310
Oil/Grease		<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH (units)	6.5-8.5	6.59	6.67	6.55	6.56	6.61	6.51	6.54	6.63	6.18
Total Kjeldehl Nitrogen		52,300	27,500	72,200	68,800	37,900	73,600	117,000	14,100	80,100
Total Organic Carbon		39,900	32,300	52,400	31,400	28,900	80,000	127,000	51,800	80,200
Metals (ppb):										
Antimony	20	<2	<2	<2	<2	<2	<2	<2	<2	<2
Arsenic	8	<5	<5	<5	<5	<5	<5	<5	<5	6.3
Beryllium	20	<.4	<.4	<.4	<.4	<.4	<.4	<.4	<.4	.51
Cadmium	4	1.61	4.95	11.53	5.03	11.88	9.74	7.8	12.82	1.71
Chromium	100	<5	<5	<5	<5	<5	14.1	<5	<5	9.4
Copper	1000	13	170	38	28	54	83	23	26	47
Lead	10	3.52	31.9	35.19	27.49	43.98	27.08	26.09	30.08	19.57
Mercury	2	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Nickel	100	18	64	39	149	25	145	<16	41	56
Selenium	50	<1	<1	<1	<1	<1	<1	<1	<1	<2
Silver	NA	<20	<20	<20	<20	<20	<20	<20	<20	<20
Thallium	10	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	5000	98	550	385	148	287	512	148	139	129
Volatile Organics (ppb):										
Benzene	1	2.8	<.5	6.5	1.5	<.5	2.3	3.3	1.0	5.7
Toluene	1000	5.2	<1.21	9.7	1.7	<1.21	<1.21	<1.21	<1.21	<1.21
Ethylbenzene	700	<.62	<.62	.95	<.62	<.62	<.62	<.62	<.62	<.62
Total xylenes	1000[1]	5.7	<2.58	5.8	<2.58	<2.58	<2.58	1.13 J	0.87 J	1.5
Chlorobenzene	50	1.4	<.22	8.7	7.2	15	13	11	<.22	<.22
1,2-Dichlorobenzene	600	<.44	<.44	1.1	.79	<.44	1.2	1.0	<.44	<.44
1,4-Dichlorobenzene	75	<.52	<.52	2.7	2.7	1.4	3.5	4.6	<.52	<.52
Vinyl chloride	5	<1.14	<1.14	<1.14	<1.14	<1.14	<1.14	<1.14	1.9	<1.14
Chloroethane	~	<0.97	<0.97	<0.97	<0.97	<0.97	<0.97	3.2	<0.97	<0.97
Total VO TICs	500[2]	16	ND	143	8	4	20	65	22	17

Notes:

* Ground Water Quality Standards, N.J.A..C. 7:9-6

< n = Not detected at the given (n) Method Detection Limit

NA = Not analyzed for

VOs = Volatile Organics

ABNs = Acid-Base-Neutral extractable organics

~ There is currently no GWQS for this compound

[1] Recently proposed GWQS for total xylenes

[2] Interim generic criterion for total synthetic organic compounds lacking evidence of carcinogenicity

B = The detected compounds were also found in the lab's method blank, indicating field/lab contamination

TICs = Tentatively Identified Compounds found in the forward library search

Table 8. (Continued)
Results of Ground Water Sampling
Landfill Leachate Parameters and PP+40
Harrison Avenue Landfill

Sample ID	GWQS*	D-3	D-4	D-5	D-6	D-7	D-8	MW-32	MW-33	Field B.
Lab ID		91995	91996	91997	91998	91999	92000	92001	92002	92003
Matrix		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Water
Date Collected		4-16-98	4-16-98	4-16-98	4-16-98	4-16-98	4-16-98	4-16-98	4-16-98	4-16-98
Leachate Parameters (ppb):										
Cyanide	200	NA	<50	<50	<50	<50	<50	<50	<50	<50
Phenols	4000	NA	<100	<100	<100	<100	<100	<100	<100	<100
Nitrate-Nitrogen	10,000	1210	930	700	1250	1020	720	710	780	<100
Nitrite-Nitrogen	1000	<10	<10	<10	14	<10	<10	<10	<10	<10
Ammonia-Nitrogen	500	25,700	<100	<100	<1000	<1000	26,600	<100	<100	<100
COD		300,000	76,000	255,000	86,000	519,000	137,000	334,000	189,000	<10,000
BOD		7000	<3000	3000	3,000	9000	<3000	15,000	22,000	<3000
Sulfates	250,000	13,000	38,500	50,100	39,300	112,000	77,600	20,200	16,900	<1000
Total Suspended Solids		26,000	142,000	90,000	39,000	147,00	107,000	420,000	340,000	<1000
Total Solids		2,450,000	1,240,000	1,920,000	650,000	3,120,000	1,440,000	1,390,000	1,330,000	<10,000
TPH		<310	<300	<320	<320	<320	<310	2900	<310	<310
Oil/Grease		<1000	<1000	<1000	<1000	<1000	<1000	19,400	<1000	<1000
pH (units)	6.5-8.5	**6.11**	6.94	**6.21**	6.65	**6.08**	7.01	**6.3**	**6.19**	**6.18**
Total Kjeldehl Nitrogen		47,700	8,430	39,300	19,700	36,500	36,500	107,000	170,000	<140
Total Organic Carbon		76,800	19,300	60,000	22,400	174,000	42,000	154,000	122,000	1,200
Metals (ppb):										
Antimony	20	<2	<2	<2	<2	<2	<2	<2	<2	<2
Arsenic	8	<5	7.5	<5	<5	**10.7**	<5	**43**	7.3	<5
Beryllium	20	<4	<4	<4	<4	.74	<4	1.24	<4	<4
Cadmium	4	**6.24**	**6.42**	**5.7**	**7.58**	**7.24**	**7.08**	**10.93**	**8.92**	<.5
Chromium	100	<70	<70	<70	<70	18.9	<70	**157.7**	**137.5**	<70
Copper	1000	15	29	22	63	41	32	441	209	<10
Lead	10	5.58	**18.11**	5.75	**29.31**	**15.27**	**13.98**	**69.21**	**49.96**	<.5
Mercury	2	<.5	<.5	<.5	<.5	<.5	.53	<.5	<.5	<.5
Nickel	100	28	55	58	<16	67	29	**455**	91	<16
Selenium	50	<2	<2	<2	<2	<2	<2	<2	<2	<2
Silver	–	<20	<20	<20	<20	<20	<20	<20	<20	<20
Thallium	10	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	5000	78	112	91	160	136	128	1378	1048	<10
Pesticides/PCBs (ppb):										
Delta-BHC	–	NA	<.07	<.07	<.07	<.07	<.07	0.29	<.07	
Volatile Organics (ppb):										
Benzene	1	<.5	<.5	<.5	<.5	**1.6**	<.5	**2.9**	.96	<.5
Toluene		<1.21	<1.21	<1.21	<1.21	<1.21	<1.21	5.5	1.4	<1.21
Ethylbenzene	700	<.62	<.62	<.62	<.62	1.4	<.62	.61 J	<.62	<.62
Total xylenes	1000[1]	<2.58	<2.58	<2.58	<2.58	1.1 J	<2.58	3.4	2.37	<2.58
Chlorobenzene	50	<.22	<.22	<.22	<.22	<.22	<.22	5.8	5.1	<.22
1,2-Dichlorobenzene	600	<.44	<.44	<.44	<.44	<.44	<.44	1.0	<.44	<.44
1,4-Dichlorobenzene	75	<.52	<.52	<.52	<.52	<.52	<.52	3.5	.87	<.52
Trans-1,2-Dichloroethene	100	<1.15	1.1 J	<1.15	<1.15	<1.15	<1.15	<1.15	<1.15	<1.15
Trichloroethene	1	<.87	<.87	<.87	**1.6**	<.87	<.87	<.87	<.87	<.87
Total VO TICs	500[2]	ND	8	16	7	18	13	37	22	12B
Acid-Base-Neutrals (ppb):										
1,4-Dichlorobenzene	75	NA	<.38	<.37	<.36	<.36	<.35	3.0	0.57	<.36
1,2-Dichlorobenzene	600	NA	<.36	<.35	<.34	<.34	<.33	0.78	<.35	<.34
Isophorone	100	NA	<.21	<.20	<.19	<.19	<.19	3.6	<.20	<.19
Naphthalene	–	NA	<.71	<.69	<.67	8.1	<.67	<.68	<.69	<.67
Total ABN TICs	500[2]	NA	69	33	42	154	36	**1463**	446	11

Notes:

* Ground Water Quality Standards, N.J.A..C..7:9-6
<n = Not detected at the given (n) Method Detection Limit
NA = Not analyzed for
VOs = Volatile Organics
ABNs = Acid-Base-Neutral extractable organics
– There is currently no GWQS for this compound

[1] Recently proposed GWQS for total xylenes
[2] Interim generic criterion for total synthetic organic compounds lacking evidence of carcinogenicity
B= The detected compounds were also found in the lab's method blank, indicating field/lab contamination
TICs = Tentatively Identified Compounds found in the forward library search

nc was detected in all of the wells, at concentrations ranging from 78 to 1378 ppb. These centrations do not exceed the GWQS of 5000 ppb.

Benzene was detected in 10 wells at concentrations ranging from 0.96 to 5.7 ppb. It exceeds GWQS of 1 ppb in 8 of the wells, namely, B-21, B-23, B-24, B-27, B-28, D-2, D-7, and MW-

Other volatile organics were found in one or a few wells; however, their detected centrations were well below their respective GWQS. The exception was trichloroethene that detected in D-6 at a slightly elevated concentration of 1.6 ppb (above the GWQS of 1 ppb).

Only a few compounds such as 1,2-dichlorobenzene and 1,4-dichlorobenzene were detected e analysis for acid-base-neutral extractables. All concentrations are well below their respective QS. One well, MW-32, however, registered total TICs of 1463 ppb that exceeds the NJDEP's ric criteria of 500 ppb for total synthetic organic compounds lacking evidence for nogenicity. The 1996 sampling rounds (by Sadat) indicated that most of acid-base-neutrals either not detected, or were detected at very low concentrations.

No pesticides, PCBs, cyanides, and phenols were detected in any of the samples, except for ample obtained from MW-32 that contained delta-BHC (a pesticide) at a low concentration of ppb. There is no GWQS for this compound. The 1996 sampling rounds also indicated that parameters were not detected in the ground water.

Comparing the results for the "shallow" with that of the "deep" wells, it can be noted that ontaminants found in both aquifers are similar. Concentrations in the upper aquifer are ally slightly higher (with no order-of-magnitude differences). The two notable exceptions are: e elevated concentrations of ammonia in the lower aquifer, and 2) the presence of ene (as noted in one well) in the lower aquifer.

It should be noted that during the 1991 sampling rounds conducted by Cortell/ITC, other etals (not included in the EPA's priority pollutant metals list, and not analyzed for in the April 1998 sampling round) were found to exceed the GWQS. These were iron, manganese, and sodium.

4.7 Soil Borings - April 23 and 28, 1998

To supplement earlier soil-boring data obtained during well-drilling activities, 8 additional borings were conducted by Envirotech on April 23 and 28, 1998 for the purpose of determining the aerial extent of and depth to the peat or clay layer located at the bottom of the refuse/debris. The soil borings were advanced using a SIMCO Earthprobe 200 equipped with Geoprobe[R] tooling. Soil cores were continuously collected using the 2" ID, 4' long stainless steel Macro-core Soil Sampler. Disposal polyethylene liners were placed in the sampler for each 3 or 4 feet of advance. The liners were cut open for inspection of each core.

The locations of the borings are indicated on the site plan in Appendix B.8. Detailed descriptions of the refuse/debris and underlying peat/clay are contained in the boring logs (Appendix E.4). Elevations of these units are found in Appendix E.3. Following boring activities, all boreholes were sealed with bentonite and cuttings.

Not all of the borings penetrated the whole thickness of the confining layer below the refuse/debris; however, data collected during these boring activities supplemented with data collected during well-drilling activities have provided a good characterization of the confining layer as well as of the lower aquifer. This is discussed in detail in Section 5 of this report.

A survey of the land surface elevations at the boring locations was conducted by Macdel Engineering in May 1998. The tabulated results showing elevations and NJ State Plane Coordinates re contained in Appendix E.7.

4.8 Delineation of Free Product at MW-30

During well sampling activities (April 15 and 16, 1998), it was noted that at least 2 inches of free product was noted on the water table in MW-30 (a 2" diameter piezometer). The product was noted to be thick and had an oily odor. On May 7 and 14, 1998, Envirotech conducted soil borings around MW-30 to delineate the extent of free product. (The adjacent "deep well," D-2 which is 6 feet from MW-30, did not contain free product or sheen based on Envirotech's sampling and previous sampling by others.)

A total of 10 borings (B-30A through B-30J) were advanced to approximately 16 feet below grade (within the water-table aquifer) using the SIMCO Earthprobe 200 equipped with Geoprobe[R] tooling. (See Appendix B.8 for site map with boring locations.) Delineation was conducted along 4 directions starting near MW-30. Where free-product was obviously noted in a boring (e.g., at B-30B and B-30G), the subsequent borings were placed several feet further along a direction away from MW-30. Initially, an interval of 10 feet between borings was started, however, refusal was encountered at almost all of the planned boring locations. Thus, the intervals between the borings were dictated by random locations where no refusal was encountered.

The water table was at approximately 9 to 10.5 feet below grade. The 3 or 4 ft-long soil cores were examined for evidences of petroleum (i.e., odor, sheen, and staining). No free-product was noted in the furthest borings which were B-30C (40 feet southwest of MW-30), B-30F (34 feet northwest), B-30E (40 feet northeast), and B-30J (62 feet southeast). Samples for laboratory analysis were collected from the 1-foot depth interval that appeared to represent the most contaminated interval in the borings (approximately 14 to 15 feet below grade). The samples were sent to W.A.T.E.R. Works Laboratory Inc. for TPH analysis using EPA Method 418.1.

The analytical results are contained in Appendix J.1. In summary, samples B-30C, B-30E, and B-30J contained TPH at relatively low concentrations of 610, 415, and 516 ppm, respectively;

while B-30F contained TPH at a high concentration of 73,830 ppm. This elevated concentration is above the NJDEP's interim cleanup level of 10,000 ppm and the EPA's hazardous waste level of 30,000 ppm. It should be noted, however, that field observations indicated the absence of free product or sheen that would be expected for soil contaminated with petroleum at this concentration (73,830 ppm). Thus, the elevated TPH level is attributed to other materials in the refuse/debris such as bituminous (e.g., asphalt or coaly) fragments. It is therefore considered that free product has been delineated towards the northwest by this boring. In anticipation of soil remediation by excavation, special attention should be given in this area and post-excavation samples should be collected to verify the success of cleanup.

4.9 Well Search Results and Identification of Adjacent Contaminated Sites

A search of permitted wells within a 1-mile radius of the subject site was conducted in order to identify possible ground-water receptors in the area, as well as to identify other contaminated sites adjacent to the subject site. A research of government databases also was conducted to obtain information on adjacent, contaminated sites. The results of the well search are contained in Appendix H.1, while the results of the contaminated site search are summarized in Table 9.

The well search results indicate that there are no domestic or potable/industrial wells located within 1000 feet of the site. The nearest confirmed well in the area is an industrial well (owned by Honeyware, Inc. at 244 Duke Street, Kearny, NJ) located approximately 0.6 miles to the west of the site and is not downgradient of the subject site. Another industrial well (Nick Verzaleno, Foot of Bergen Avenue, Kearny) was identified in the well records search, however, it cannot be confirmed since the well was installed in 1959 and the exact address and ownership could not be traced. Most likely, this well has been abandoned.

Table 9.
Contaminated Sites within 0.5-Mile Radius
Harrison Avenue Landfill

Site Name	Address	Database	Comments*
Diamond Head Oil Refinery	1401 Harrison Tpk, Kearny (Lots 3, 14, &15 Block 285)	SHWS- (may be elevated to NPL status)	Located 500 ft south & upgradient of subject site
Municipal Sanitary Landfill 1-D	1500 Harrison Avenue or Turnpike, Kearny (Lot 2 Block 285)	SHWS, CERC-NFRAP, FINDS, LF	Located 1500 ft southeast & upgradient of subject site
Route 508 & NJ Turnpike	Route 508 & NJ Turnpike, Kearny (Lot 47 Block 286)	SHWS	Located 400 ft southeast & upgradient of subject site
Campbell Foundry Co.	1235 Harrison Turnpike, Kearny	SHWS, CORRACTS, CERC-NFRAP, UST, NJ Spills	Not considered upgradient of subject site
Universal Flavors	265 Harrison Turnpike, Kearny	LUST	Not considered upgradient of subject site

Notes:
SHWS= State (New Jersey) Hazardous Waste Site
NPL= National Priority List (Superfund)
CERC-NFRAP= CERCLA-No Further Remedial Action Planned
FINDS= Federal Facility Index System
LUST= Leaking Underground Storage Tank
UST= Underground Storage Tank facility
LF= Landfill
*The determination of "upgradient" location is based on ground-water flow in the lower aquifer

Based on the list (Table 9) and direction of ground-water flow in the lower aquifer, there are three contaminated sites located upgradient of the subject property. The nearest one is the former Diamond Head Oil Refinery which is located 500 feet south of the subject site. According to the EPA, this site may elevated to the National Priority List (NPL or Superfund) status.

Another hydraulically upgradient site is the Municipal Sanitary Landfill 1-D, located approximately 1500 feet southeast of the subject site. This site is a major landfill that has been closed. It has been listed as a contaminated site.

The third potentially upgradient site is the Route 508 & NJ Turnpike site which is located near the Exit 15W Interchange. No details could be obtained at this time, however, based on a field reconnaissance, it appears to be a landfill of similar size as the subject site.

Envirotech had attempted to contact the existing or previous Case Managers in order to obtain more detailed information such as ground-water contaminants and ground-water flow. To date, no further information has been provided.

Based on the results of ground-water sampling on the subject site and the nature of the leaky confining layer (see Section 5 for hydrogeology), it is evident that contaminants found in the lower aquifer can be attributed to leachate from the water-table aquifer. The possibility of off-site sources, however, has not been ruled out. As an example, one contaminant that can be attributed to an off-site source is trichloroethene which was found in D-6 at a concentration of 1.6 ppb (above the GWQS of 1 ppb). It was not found in any of the other wells, nor during earlier sampling rounds. D-6 is screened in the lower aquifer and is located near the upgradient property line. Trichloroethene, like many chlorinated solvents, is known to be recalcitrant and to migrate over long distances without significantly degrading.

5.0 HYDROGEOLOGY

Information on the deep hydrogeologic units is provided by 14 engineering test borings (B-1 through B-14) conducted by Melick-Tully in 1989 (see Appendix E.5 for Melick-Tully boring logs). These were the only deep borings conducted on site and reached total depths ranging from 102 to 152 feet below grade. Additional information on the water-table aquifer, confining peat/clay, and lower sandy aquifer is based on data from monitoring wells and borings conducted by ITC in 1991, Sadat in 1996, and Envirotech in 1998.

The upper or water-table aquifer is defined by the extent of the landfill's refuse and debris. Drainage of this aquifer is occurring along the outer fringes of the landfill mass, thus the aquifer occurs as a localized water-table aquifer and is not considered the regional water-table aquifer. This landfill refuse/debris unit is underlain by a distinct confining layer consisting of peat/organic silt nd a unit of silty sand with clay lenses. This peat layer is located a few feet below Mean Sea Level. The unit consisting of clay lenses in silty sand grades downward into silty sands that comprise the lower aquifer. The lower aquifer further grades downward into a unit of dense varved silt and clay (typical Pleistocene glaciolacustrine deposits in this region) which is considered the bottom of the lower aquifer (between 19 to 38 feet below MSL). This unit of dense varved silt and clay ranges from 70 to 95 feet thick. The varved silt and clay unit is underlain by a distinct layer of hard, reddish-brown silt and gravel (Pleistocene glacial till). The glacial till is several feet thick and is underlain by shale. (Decomposed shale was noted in boring B-5 at a depth of 126 feet below grade or 106 feet below MSL.)

According to the U.S.G.S. Geologic Map of the Newark 1° x 2° quadrangle (P. Lyttle and J. Epstein, 1987), the site is underlain by the Passaic Formation of the Brunswick Group (Lower Jurassic to Upper Triassic) which consists of grayish-red to reddish-brown shale, siltstone, sandstone, and red-matrix conglomerate. The Passaic or Brunswick Formation, which is a source of water for many industrial and commercial wells in the region, has a maximum thickness of 8760 feet in this region.

5.1 Water-Table Aquifer

Refuse includes typical household and commercial refuse as indicated by decaying organic material, bottles/glass, cloth, paper, leather, plastics, etc. Construction or demolition debris are indicated by wood, ceramic fragments, rubber, concrete, asphalt, brick, steel, insulation materials, paint cans, etc. It was also noted that typically starting at 4 feet below grade and deeper, the underlying material is mostly gray to black and commonly burnt and mixed with cinders and ash.

The eastern portion of the site (e.g., as noted in MW-32), was noted to contain a large percentage of ash and cinders in the refuse.

The refuse mound has a maximum thickness of approximately 33.5 feet as noted in boring B-11, and a minimum thickness of 5 feet as noted in monitoring well B-21. The maximum saturated thickness of the aquifer is estimated at 15 feet. The bottom of this unit is typically located a few feet below MSL, with an average elevation of -4.32 feet and a range of -1.4 to -11 feet.

During sampling activities in April of 1998, the water table in this aquifer ranged in depth from 3.6 feet below grade (in MW-33) to 15.78 feet below grade (in MW-31). This reflects the irregular topography of the landfill. The actual ground-water elevations range from 4.52 to 7.22 feet above MSL. The ground-water elevation contours generally reflect the topography of the land surface. (See Appendix B.5.) Ground-water flow is towards the periphery of the landfill, i.e., towards the wetland areas along the northern and southern perimeters, and drainage ditches along the southeastern and western perimeters of the landfill. Actual seepage or discharge of ground water into the wetlands was noted by Envirotech April of 1998 along the northern periphery of the landfill. Discharge of landfill leachate into the wetlands is therefore occurring. The wells screened in the water-table aquifer indicate ground-water elevations that are higher than those of the hydraulic heads at the wells screened in the lower aquifer. This indicates a downward component of flow from the upper to the lower aquifer, except along the periphery where an upward flow from the lower aquifer towards the wetlands is occurring.

Slug testing of wells screened in this formation indicates that the hydraulic conductivity values obtained for the upper aquifer range from 23.2 to 52.4 ft/day, with an average of 38.1 ft/day. This indicates good permeability in the upper (water-table) aquifer, as can be expected in uncompacted refuse and debris. The aquifer is anticipated to initially sustain pumping rates of at least 20 gallons per minute. Long-term pumping would lower the water table and eventually drain this aquifer.

5.2 Confining Peat/Clay Layer

The bottom of the landfill refuse and debris lies a few feet below Mean Sea Level. In many areas, this bottom is characterized by a thin layer (a few inches thick) of soft, organic silt layer with peat. It was encountered in many borings at depths ranging from 1.5 to 6 feet below Mean Sea Level. This layer was not encountered in some borings possibly due to its non-existence in that area, but more likely due to the overlying refuse/debris and the thin, soft nature of the peat layer (i.e., the sampling tools such as split-spoons could have easily pushed refuse and debris downwards through the peat, thereby precluding the collection of a sample from or observation of the underlying peat layer). The presence of peat underlying the landfill refuse/debris indicates that a marshy or boggy environment had existed on site prior to use as landfill.

The peat consists of decomposed leaves and roots and is typically 2 to 5 inches thick. It is brown, dark brown, or grayish brown (occasionally black) in color. The maximum thickness as noted in one boring is 8 inches; however, due to compression while driving the sampling tools, the peat may be as much as 1 foot thick. It interfingers with and is underlain in a few places by brown to grayish brown organic silt which is denser than the peat. Thin (typically less than an inch thick) sandy lenses occasionally occur within this silt unit. Plant roots are often found in this organic silt layer which is typically 4 to 6 inches thick. The maximum thickness of this silt unit is estimated to be 1 foot.

In some places (e.g., B-36, B-39, D-4) the peat/organic silt layer was noted to be the confining layer that separates the water-table aquifer from the underlying sandy aquifer.

Immediately upon punching through this confining layer, an artesian condition (rise in water level due to pressure in the lower aquifer) was noted.

In the deeper borings (e.g., during drilling of monitoring wells), it was noted that the peat/organic silt layer is further underlain by a thicker unit of clay which serves as the more effective confining unit. It was found in all of the monitoring wells installed in 1998 (D-4 through D-8), in three of the soil borings conducted by Envirotech in April of 1998 (i.e., B-34, B-35, and B-38), and in most of the earlier borings (e.g., B-1 through B-14). This unit is estimated at 2 to 4 feet thick and is referred to in this report as "clay layer," but is actually a composite layer consisting of sands and silt with lenses of dense clay. The silty sands are typically medium to fine-grained, with gray, brown, and grayish blue-green colors. Some coarse sand lenses also were noted. The clay lenses are characteristically grayish blue-green (occasionally brown) in color, dense, and typically occurs as 1 to 2 inch thick lenses within the silty sands. The bottom of this unit is not distinct. It grades downward into the lower aquifer.

Due to the thin nature of the peat/organic silt layer and the discontinuity of the clay lenses in the thicker confining unit (consisting of silty sand with clay lenses), the confining unit is considered leaky. Furthermore, the ground-water sampling results indicate that the upper and lower aquifers are contaminated with similar contaminants at concentrations showing no major (order of magnitude) difference. This also indicates that the confining layer is leaky.

5.3 Lower Aquifer

The confining clay unit described above grades downwards into the lower aquifer which consists of brown to gray, silty, coarse to fine sands with trace clay lenses. The top of this aquifer ranges in elevation from -4 to -11.1 feet. Based on the deepest borings (B-1 through B-14) and some of the deep wells (D-1 through D-4, D-8), the bottom of this aquifer is at -19 to -38 feet. The contact with the underlying impermeable unit (varved silts and clays) is gradational. The thickness of the lower aquifer ranges from 13.5 to 31.5 feet, with an average of 20 feet thick. According to the "*Draft Remedial Investigation Report...*" prepared by Sadat, samples from this underlying varved silt/clay unit were taken during well-drilling activities at D-1, D-2, and D-3. The samples were tested in the laboratory for hydraulic conductivity. The values obtained were $1x10^{-6}$, 3.01×10^{-7}, and $3.14x10^{-6}$, respectively. However, no units were given. The hydraulic conductivity units are assumed to be in cm/sec, thereby indicating that the material may be considered impermeable.

Within the property limits, this aquifer has been established to be a confined aquifer as indicated by artesian conditions at the "deep" monitoring wells (i.e., hydraulic heads or ground-water levels rising above the top of the aquifer or the confining layer). It is possible that water-table conditions, i.e., no confining peat/clay layer, exist for this aquifer in the non-landfill areas outside of the subject property. In this case, the lower aquifer may be regionally considered a semi-confined aquifer. If water-table conditions exist upgradient of the subject site, then contamination from upgradient sources (e.g., surface spills) could more readily migrate towards the lower aquifer of the subject site.

Slug testing at 4 wells screened in the lower aquifer resulted in estimated hydraulic conductivity values ranging from 3.2 to 8.8 ft/day, with an average of 6.02 ft/day. These values are typical of silty sands and fine sands. This aquifer is anticipated to sustain pumping rates of at least 8 gallons per minute. During well-sampling activities in April of 1998, ground-water levels in the "deep" wells screened within the lower aquifer ranged in elevation from 3.88 feet above MSL (in D-1) to 5.42 feet above MSL (in D-4). Ground-water flow in this aquifer is towards the north-northwest (see Potentiometric Surface Map, Appendix B.6). An upward flow component is believed to exist along the northern periphery of the landfill with flow lines crossing the confining layer and discharging along the bottom of the surface water in the wetlands. (See hydrogeologic cross-sections in Appendix B.4.)

6.0 CONTAMINANTS AND AREAS OF CONCERN

6.1 Soil Areas of Concern

The sampling data that has been generated for this site indicates that the soil in this landfill contains petroleum hydrocarbons (TPH), metals, volatile organics, and PCBs. Several areas show contamination at levels exceeding the RDCSCC or NRDCSCC. A few areas show contamination by TPH and PCBs at levels exceeding the hazardous waste levels (HWL); it is anticipated that remediation will be conducted only for these areas. The remaining contamination (below the HWL) will be addressed by engineering and institutional controls.

The following areas of concern (Table 10) have been identified based on contaminant concentrations exceeding the HWL (see Appendix B.8 for site map showing these areas of concern):

Table 10.
Areas and Contaminants of Concern (exceeding Hazardous Waste Levels) in Soil
Harrison Avenue Landfill

Area of Concern	Contaminant of Concern	Sample ID, (Depth); and Concentration
Boring B-4	Polychlorinated Biphenyls (PCBs)	B-4 (9'-11'); 62 ppm B-4B (9'-11'); 890 ppm
Boring B-28	Petroleum Hydrocarbons (TPH)	B-28 (3'-4'); 43,000 ppm
Monitoring Well MW-30	Free product on water table; TPH in soil	B-30F* (14'-15'); 73,830 ppm
Test Pit TP-7	Petroleum Hydrocarbons (TPH)	TP-7 (**); 580,000 ppm
Test Pit E6	Petroleum Hydrocarbons (TPH)	E6-B (9'); 30,330 ppm TPH-7 (9'); 105,810 ppm

Notes:

*10 borings were installed around MW-30 to delineate free product at the water-table level; sample B-30F was located 34' NNW of the well; elevated TPH in B-30F is not attributed to petroleum free product.

**Sampling depth was not indicated in the Cortell report

Table 11 summarizes the areas of concern and the soil borings/test pits that were conducted to delineate these areas. (See boring and test pit locations and areas of concern on site plan in Appendix B.8.)

Table 11.
Summary of Delineation Samples
Harrison Avenue Landfill

Area of Concern	Boring B-4 (PCBs)							Boring B-28 and Test Pit TP-7 (TPH)			
Boring/ Test pit#	B-4(a)	B-4(b)	B-4(c)	B-4(d)	P-1	P-2	P-3	TPH-9	TPH-10	TPH-11	TPH-12
Compound detected over HWL (yes/no)	No	Yes	No	No	No	No	No	No	No	No	No

Area of Concern	Test Pit E-6 (TPH)											
Boring/ Test pit #	TPH-1	TPH-2	TPH-3	TPH-4	TPH-5	TPH-6	TPH-7	TPH-8	TPH-13	TPH-14	TPH-15	TPH-16
Compound detected over HWL (yes/no)	No	No	No	No	No	No	Yes	No	No	No	No	No

Area of Concern	Monitoring Well MW-30 (Free Product and TPH)									
Boring/ Test pit #	B-30A	B-30B	B-30C	B-30D	B-30E	B-30F	B-30G	B-30H	B-30I	B-30J
Compound detected over HWL (yes/no)	Free Product	Free product	No	Free Product	No	Yes*	Free Product	Free Product	Free Product	No

Notes:
* Not attributed to petroleum free product being delineated
HWL= Hazardous Waste Level

6.2 Ground-Water Contaminants

The following table (Table 12) identifies the ground-water contaminants that were found to exceed the GWQS during the April 1998 sampling event. The highest levels of arsenic, chromium, lead, nickel, and non-targeted organics were found in MW-32 and MW-33 which are located in the eastern portion of the site. It should be noted that the 1991 sampling rounds included the analysis for other metals that are not in the EPA's priority pollutant metals list, but are included in the

Table 12.
Ground Water Contaminants Exceeding New Jersey's GWQS
Harrison Avenue Landfill

(All values in ppb)

Contaminant	GWQS	WATER TABLE AQUIFER									LOWER AQUIFER								
		B-22	B-23	B-24	B-26	B-27	B-28	MW-30	MW-32	MW-33	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	B-21
Ammonia	500		620	510								57,400	25,700					26,600	
PH	6.5-8.5							Free-	6.3	6.19		6.18	6.11		6.21		6.08		
Arsenic	8							Phase	43								10.7		
Cadmium	4	4.95	11.53	5.03	11.88	9.74	7.8	Product	10.93	8.92	12.82		6.24	6.42	5.7	7.58	7.24	7.08	
Chromium	100								157.7	137.5									
Lead	10	31.9	35.19	27.49	43.98	27.08	26.09		69.21	49.96	30.08	19.57		18.11		29.31	15.27	13.98	
Nickel	100			149		145			455										
Iron*	300	320,000	210,000	250,000	280,000	140,000													120,000
Manganese*	50	2500	1400	1400	1600	1000	1500												2000
Sodium*	50,000	52,000				88,000	720,000												420,000
Benzene	1		6.5	1.5		2.3	3.3		2.9			5.7					1.6		2.8
Trichloro-ethene	1															1.6			
Total ABN TICs	500**								1463										

Notes:

All values in parts per billion (ppb)
GWQS = New Jersey Ground Water Quality Standards (NJAC 7:9-6)
*Based on 1991 sampling rounds (Cortell/ITC)
** Interim generic criterion for total synthetic organic compounds lacking evidence of carcinogenicity
No entry indicates that the compound was not analyzed for, not detected, or was detected at a concentration below the GWQS
ABN TICs = Acid-Base-Neutral extractables, non-targeted compounds found in the library search

EPA's target compound list. Three of these (iron, manganese, and sodium) were found to exceed New Jersey's GWQS, therefore, they are included in Table 12.

7.0 DISCUSSION AND RECOMMENDATIONS

7.1 Alternate Cleanup Levels for Soil

Soil sampling data indicate the presence of a range of contaminants including TPH, PCBs, metals, and Volatile Organics at concentrations exceeding New Jersey's Residential and Non-Residential Direct Contact Soil Cleanup Criteria. Cleanup of soil contamination in this landfill to comply with Residential or Non-Residential Direct Contact Soil Cleanup Criteria would entail prohibitive costs and would be of no major benefit to the environment considering that this area in Kearny is an industrial area with no residential properties or potable/industrial wells within a half mile of the site. It is therefore proposed that alternate cleanup levels be used for this site.

The remedial action that has been anticipated for this site with regard to soil is to install engineering and institutional controls such as capping and a Declaration of Environmental Restrictions. Capping of the whole site would prevent the exposure of such contaminants and the generation of leachate whereby soil contamination is released into the environment. There are, however, a few areas of concern with PCB and TPH contamination at levels exceeding the state and federal hazardous waste levels. It is our recommendation that the alternate cleanup levels be based on hazardous waste levels and that these areas of concern (see Table 9.) be addressed by active remediation (e.g., excavation and off-site disposal) in order to remove hazardous waste as well as major sources of soil contamination. Remedial investigations by others and by Envirotech have delineated these areas of concern.

7.2 Mitigation of Landfill Gas

Sadat's scope of work in 1996 included a soil gas survey which indicated the presence of combustible gases, elevated %LELs, and low %oxygen levels. During Envirotech's investigation at the site, the gripper plug (casing cap) from one monitoring well, D-3, was noted to violently pop out of the casing upon removal. This indicates the danger of landfill-gas buildup which should ultimately be addressed by designing and constructing gas vents and/or active gas recovery systems. Further soil-gas studies should be conducted and included in the preparation of a Remedial Action Workplan.

7.3 Ground-Water, Wetlands, and Surface-Water Contamination

The local water-table aquifer contains leachate with ammonia, metals (arsenic, cadmium, chromium, lead, and nickel), and benzene at concentrations exceeding New Jersey's Ground Water Quality Standards (GWQS). Cadmium and lead occur as the most persistent contaminants. Drainage of the water-table aquifer is towards the wetlands along the northern and southern periphery of the landfill, and drainage ditches along the southeastern and western peripheries. Free product (petroleum) in the area of MW-30 remains to be addressed. It was noted that the free product is found only in the upper aquifer in this area, however, benzene was detected at 5.7 ppb in the lower aquifer based on sampling results for the nearby "deep" well D-2. This indicates that a dissolved-phase plume is developing in this area.

The lower (confined) aquifer is contaminated with similar metals at concentrations slightly lower than those found in the water-table aquifer. Similarly, benzene and ammonia were found in a few wells at concentrations exceeding the GWQS. Ammonia was found in 3 wells at elevated concentrations that are higher than the GWQS and concentrations found in the upper aquifer.

Trichloroethene was found in one well at a concentration of 1.6 ppb, which exceeds the GWQS of 1 ppb. It was not detected in the water-table aquifer presumably because trichloroethene, like many chlorinated solvents, tends to quickly migrate toward lower aquifers by virtue of its density. The hydrogeology of the site indicates that ground-water flow in this aquifer is consistently towards the north-northwest or towards the wetlands. The equipotential and flow lines suggest discharge towards the surface water in the wetlands located along the northern periphery of the landfill.

The well search results indicate that there are neither domestic nor potable/industrial wells located within 1000 feet of the site. The nearest well in the area is an industrial well located approximately 0.6 miles to the west of the site and is not downgradient of the subject site. Thus, there appears to be no ground-water withdrawal points that may be impacted by contamination on the subject site.

Samples collected from the surface water of the wetlands along the northern periphery indicate the presence of copper, lead, nickel, zinc, and leachate parameters (e.g., nitrate, nitrite, sulfates) the source of which can be attributed to surface runoff and drainage of leachate-containing ground-water from the water-table and lower aquifers. The sediment samples obtained from the wetlands further indicate the presence of additional metals such as cadmium, mercury, chromium, arsenic, etc. Also, low levels of volatile organics and base-neutral extractable organics were detected in the samples.

Based on the characterization of the site's hydrogeology, the leachate plume from the water-table aquifer also discharges into the drainage ditch located along the western periphery of the landfill. This ditch drains into Frank's Creek which is a tributary of the Passaic River.

A baseline ecological evaluation which is based on the wetlands sampling results, ground-water sampling results, and characterization of the site's hydrogeology indicate that the adjacent wetlands and other surface water bodies are impacted by surface runoff and a leachate plume that has developed in the water-table and lower aquifers. Wetlands are sensitive receptors and are important ecological systems since they provide habitat for wildlife (particularly birds), reduce floods and erosion, and improve water quality. Drainage from the water-table aquifer also goes into Frank's Creek which in turn drains into the Passaic River. The Passaic River basin is the largest river basin in northern New Jersey.

However, based on the results of surface-water sampling (in Kearny Marsh) near Landfill 1-C (located approximately 1 mile north of the subject site), it can be concluded that the wetlands also have been impacted by contamination from other sites. While 2 metals were found at higher levels on site, many of the other parameters such as conductivity, ammonia, BOD, TSS, cadmium, chromium, and lead were higher in the Kearny Marsh samples obtained near Landfill 1-C.

Development of the subject property should include a ground-water recovery system that is able to control and treat the contaminant plume, thereby preventing discharge of contaminants from the upper aquifer into the adjacent wetlands and drainage ditches. We therefore recommend that a feasibility study be commenced to determine the most cost-effective ground-water control and treatment system. At this time, two alternatives can be evaluated for a ground-water control system: 1) cut-off walls with supplemental ground-water recovery, and 2) a system of recovery wells with overlapping radii of influence.

It is anticipated that the site cap and the ground-water control and treatment system will minimize and mitigate the generation of leachate from the landfill, and will gradually drain the localized water-table aquifer, thereby facilitating cleanup of the leachate plume in the upper aquifer and, consequently, the lower aquifer. Discharge of contaminants from the lower aquifer into the wetlands could then be addressed using an ecological risk assessment, taking into account the data on Kearny Marsh samples and the landfills that are currently impacting the wetlands.

7.4 Summary of Recommendations

Based on the data that has been generated to date, the following is a summary of our recommendations:

- Conduct meetings with the NJDEP-Bureau of Landfill Engineering and prepare the appropriate applications necessary (e.g., landfill disruption permit) for the closure of the landfill. Perform additional work that may be required by the permit applications and by the assigned NJDEP case management team. Other permits such as discharge to surface water may also be required.
- Conduct an ecological investigation and prepare an ecological risk assessment report.
- Prepare and submit a Remedial Investigation Addendum to address further investigation that is warranted for the site, then prepare and submit the Remedial Action Workplan to address actual remedial activities. The RAW would include a proposed list of cleanup levels or alternate cleanup levels based on risk-based assessment.
- Remediate, by excavation and off-site disposal, all areas of concern in which contaminant (TPH and PCB) concentrations exceed the hazardous waste levels. (Hazardous waste levels to be proposed as the alternate soil cleanup level). Collect post-excavation samples to verify cleanup.
- Remediate free product in the ground water and affected soil at MW-30.
- Conduct supplementary soil borings and collect soil-gas samples to identify and quantify soil gases. Perform a pilot study to assist in the design of a soil-gas venting and recovery system.
- Construct an impermeable cap over the entire property, then execute a Declaration of Environmental Restrictions (DER).
- Conduct pilot tests and a feasibility study to determine the most cost-effective ground-water recovery and treatment system for the upper aquifer.

8.0 LIMITATIONS

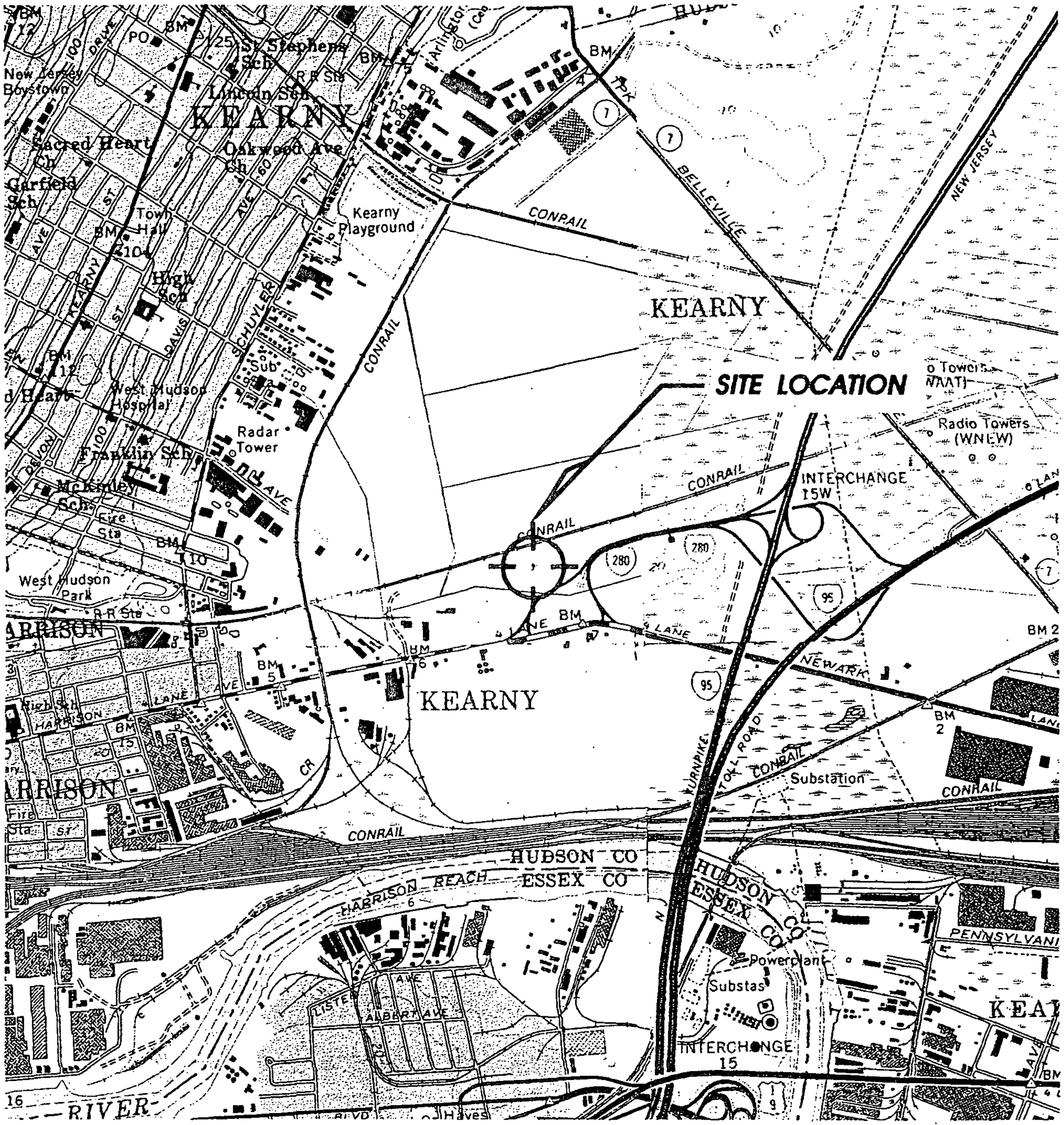
Envirotech's scope of work was limited to that described in this report and does not guarantee that no other contaminants or areas of concern exist on the subject site. The findings presented in this report were based on field observations at the time of remedial investigation, previous data generated by others, and the analytical data provided by an independent laboratory.

Our work was conducted and this report was prepared in accordance with generally accepted professional practices. We accept responsibility for the competent performance of our scope of work, but disclaim any responsibility for any consequential damages arising from our findings.

This report was prepared by: ______________________
Moses L. Alcala, Senior Geologist

Reviewed and approved by: Robert J. Dydo
Robert J. Dydo, President

June 30, 1998
Date



0 0.5 1.0 1.5 2.0 MILES

0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10,000 FEET

N

SCALE 1:24,000

CONTOUR INTERVAL = 10 FT

Source: U.S.G.S. 7.5 Minute Series (Topographic)

TOPOGRAPHIC SITE LOCATION MAP
HARRISON AVENUE LANDFILL
HARRISON AVE. KEARNY, NEW JERSEY

ENVIROTECH CONSULTANTS, INC.
Tel. No. (201) 882-1300 78 Clinton Road, Fairfield, NJ 07004 Fax No. (201) 882-4942

QUADRANGLE: ELIZABETH, JERSEY CITY, WEEHAWKEN, ORANGE	DATE: 6-8-98	APPENDIX	
PREPARED BY: TL	REVISED:		A

ITOUR INTERVAL = 0.20 FT.
:VATIONS IN FEET ABOVE MSL

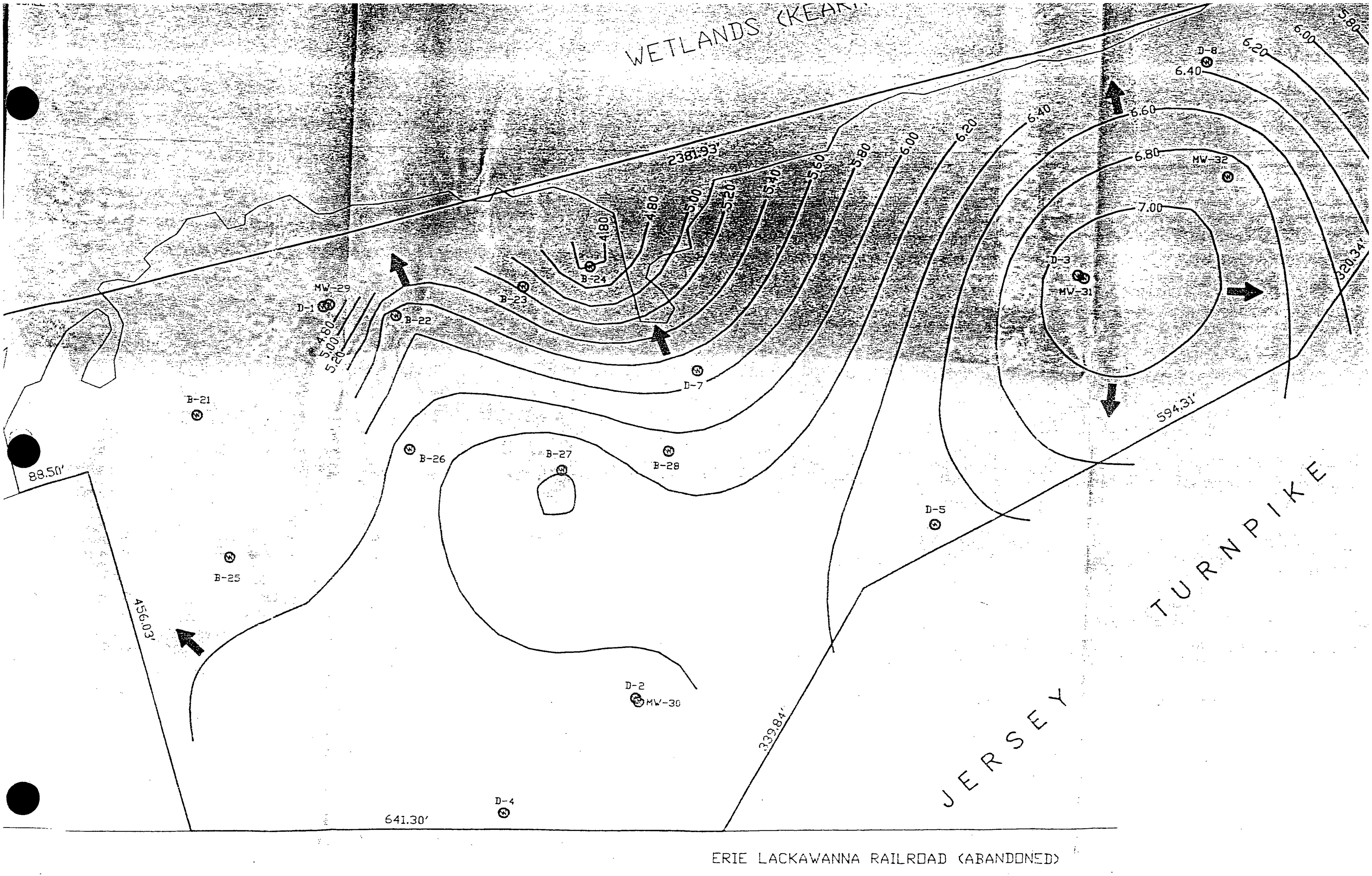
78 CLINTON R
(973) 882-1300

DISCLAIMER:
THIS DRAWING IS INTENDED TO BE USED FOR REFERENCE ONLY. IT SHOULD NOT BE USED FOR PURPOSES OTHERWISE SERVED BY A PROFESSIONAL PROPERTY SURVEY.

GROUND WATER CONTOURS (APRIL 1998)
WATER TABLE AQUIFER
HARRISON AVE. LANDFILL, KEARNY, NEW JERSEY

SCALE: 1"=100'	APPROVED BY:	DRAWN BY: TL
DATE: 6-11-98		REVISED:

BLOCK #286, LOT #4	APPENDIX B.5



WETLANDS (KEAR
2381.93'
D-8
MW-32
D-3
MW-31
MW-29
D-1
B-22
B-23
B-24
D-7
B-21
B-26
B-27
B-28
B-25
D-5
D-2
MW-30
D-4
88.50'
456.03'
641.30'
339.84'
594.31'
320.34'
4.80
5.00
5.20
5.40
5.60
5.80
6.00
6.20
6.40
6.60
6.80
7.00
JERSEY TURNPIKE
ERIE LACKAWANNA RAILROAD (ABANDONED)

NOTE: THE LOCATION OF B-4A, B-4C
AND B-4D UNKNOWN

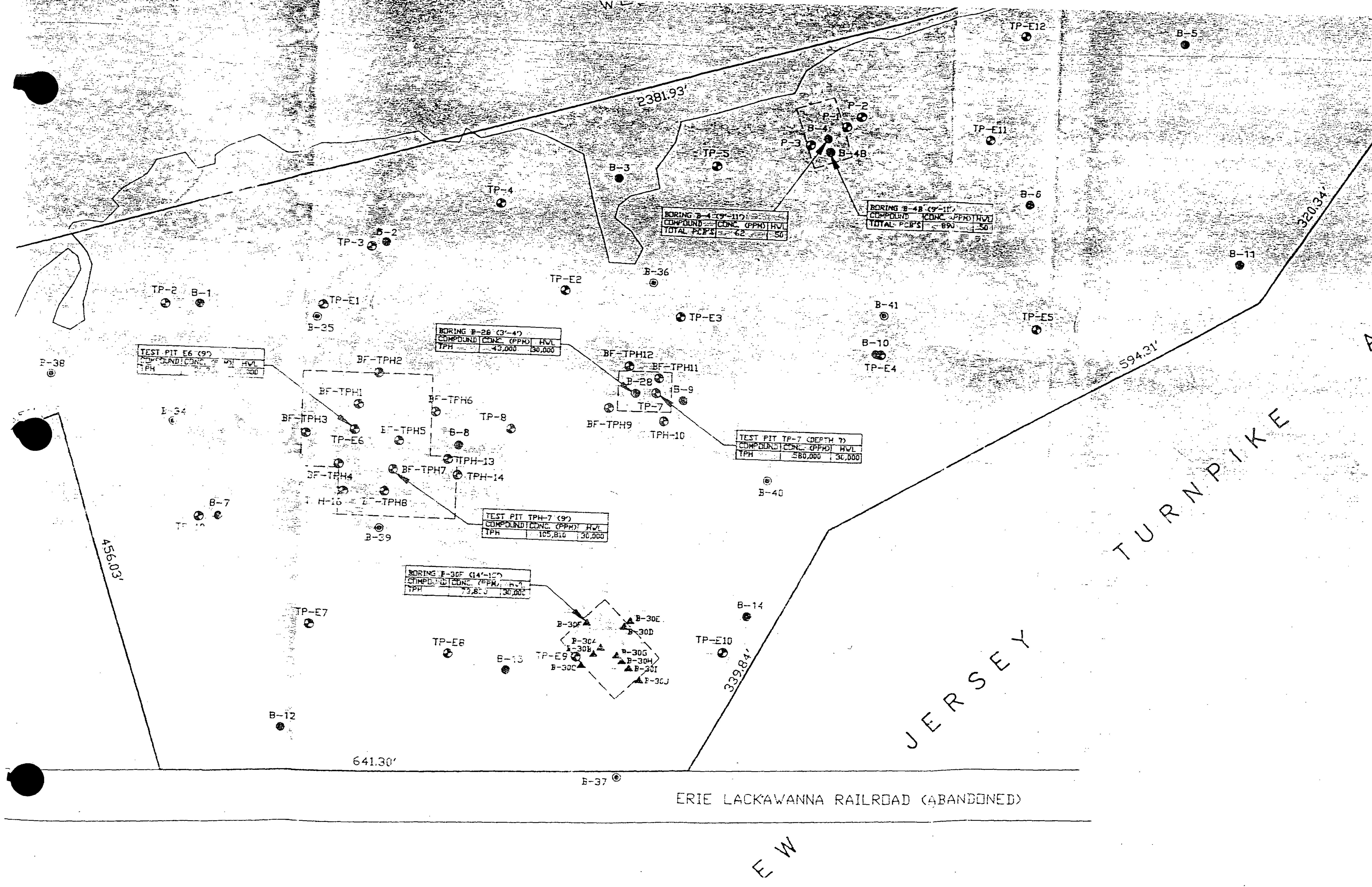
LEGEND:

- BORINGS BY OTHERS
- TEST PIT
- ENVIROTECH BORING (TO PEAT LAYER) APRIL 1998
- ENVIROTECH DELINEATION BORING, MAY 1998
- APPROXIMATE LIMITS OF AREAS OF CONCERN

CLINTON
78
(973) 882-1300

DISCLAIMER:
THIS DRAWING IS INTENDED TO BE USED FOR REFERENCE ONLY. IT SHOULD NOT BE USED FOR PURPOSES OTHERWISE SERVED BY A PROFESSIONAL PROPERTY SURVEY.

SOIL BORING/TEST PIT LOCATION MAP HARRISON AVE. LANDFILL, KEARNY, NEW JERSEY		
SCALE: 1"=100'	APPROVED BY:	DRAWN BY: TL
DATE: 6-11-98		REVISED:
AREAS OF CONCERN-SOIL		
BLOCK #286, LOT #4		APPENDIX B.8


2381.93'
TP-E12
B-5
P-2
P-1
B-4
P-3
B-4B
TP-E11
TP-5
B-3
TP-4
B-6
BORING B-4 (9'-11')
COMPOUND
CONC. (PPM)
HVL
TOTAL PCB'S
62
50
BORING B-4B (9'-11')
COMPOUND
CONC. (PPM)
HVL
TOTAL PCB'S
890
50
320.34'
TP-3
B-2
B-11
TP-E2
B-36
TP-2
B-1
TP-E1
B-35
TP-E3
B-41
TP-E5
B-10
TP-E4
BORING B-28 (3'-4')
COMPOUND
CONC. (PPM)
HVL
TPH
43,000
30,000
594.31'
B-38
TEST PIT E6 (9')
HVL
TPH
BF-TPH2
BF-TPH12
BF-TPH11
B-28
B-9
TP-7
BF-TPH1
BF-TPH6
B-34
BF-TPH3
TP-8
BF-TPH9
TPH-10
BF-TPH5
B-8
TP-E6
TEST PIT TP-7 (DEPTH 7')
COMPOUND
CONC. (PPM)
HVL
TPH
580,000
30,000
TPH-13
BF-TPH4
BF-TPH7
TPH-14
B-40
BF-TPH8
B-7
B-39
TEST PIT TPH-7 (9')
COMPOUND
CONC. (PPM)
HVL
TPH
105,810
30,000
456.03'
BORING B-30F (14'-15')
COMPOUND
TPH
30,000
B-14
TP-E7
B-30F
B-30E
B-30D
TP-E8
B-30A
B-30B
TP-E9
B-30G
B-30H
B-30C
B-30I
B-30J
TP-E10
B-13
339.84'
B-12
641.30'
B-37
ERIE LACKAWANNA RAILROAD (ABANDONED)
NEW JERSEY TURNPIKE

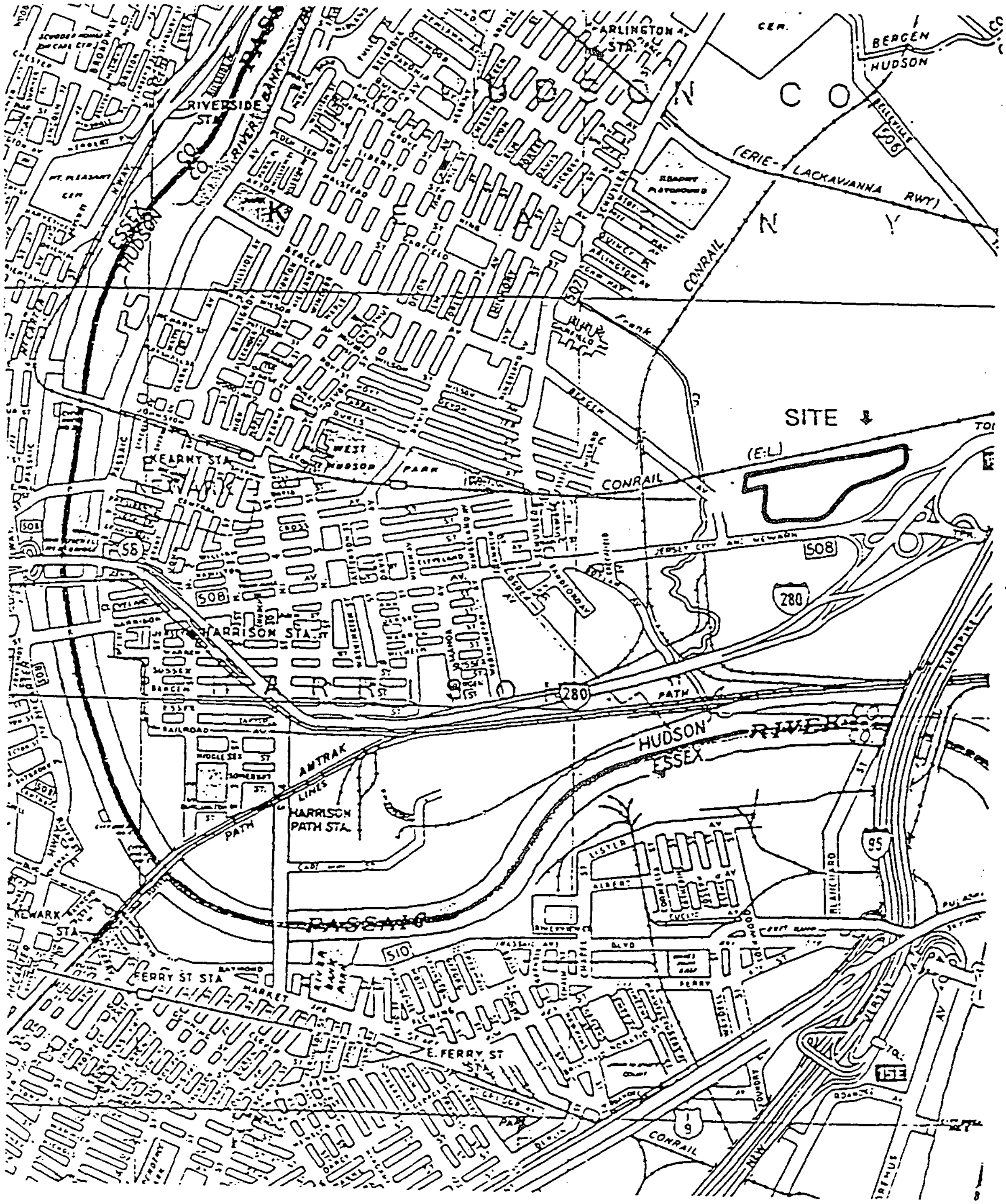
DRAFT
REMEDIAL INVESTIGATION REPORT FOR THE HARRISON AVENUE LANDFILL PROPERTY
Kearny, New Jersey

VOLUME I of VI
(Report, Tables, Figures, and Drawings)

Prepared For:
HARTZ MOUNTAIN INDUSTRIES
Secaucus, NJ

June 5, 1996

SADAT ASSOCIATES, INC.
CIVIL & ENVIRONMENTAL ENGINEERS



Sadat Associates, Inc.
PRINCETON, NEW JERSEY

Figure No. 2.1

N.T.S.

TABLE 3.3

Summary of Priority Pollutant Metals Soil Boring Sample Data
December 1988
Harrison Avenue Landfill Site
Kearny, New Jersey

Parameter	NRDCSCC*	B-1, 1-2'	B-1, 2-4'	B-2, 1-2'	B-2, 7-9'	B-3, 1-2'	B-3, 2-4'	B-4, 1-2'	B-4, 9-1	B-5, 1-2'	B-5, 14-16'	B-6, 1-2'	B-6, 17-1	B-7, 1-2'	B-7, 6-8'	B-8, 1-2'	B-8, 5-7'
Antimony	31 340	16	13	5.6	5.9	2.8	3.2	<2.5	12	3.5	16	4.4	<2.3	3.1	3.5	6.8	<5.7
Arsenic	20 20	12	12	16	20	5.9	9.8	7.6	5.8	3.1	64	12	1.6	8.2	11	8	<2.9
Beryllium	2 1	4.4	0.87	<0.71	1.2	<0.62	0.92	<0.62	<0.69	<0.58	0.9	<0.62	<0.58	<0.60	<0.76	0.68	<1.4
Cadmium	34 100	12	21	14	25	<0.62	18	14	<0.69	3.2	3.9	8.1	<0.58	8	12	6.7	2.8
Chromium	710 -	280	200	120	220	29	65	47	99	120	160	110	16	99	110	78	12
Copper	600	2,800	700	1,000	930	170	370	180	670	420	180	460	31	260	230	810	120
Lead	400 600	3,800	3,000	2,700	6,600	690	2,900	1,400	2,900	910	1,800	1,200	160	2,000	2,100	820	94
Mercury	14 270	7.2	7.5	4.6	1.2	0.72	0.92	1.3	1.5	0.7	0.34	2	0.3	5.3	<0.076	3	5.7
Nickel	[illegible] 2,400	210	520	120	110	25	40	63	42	45	120	56	19	83	94	63	<11
Selenium	63 3,100	1.5	1.7	2.3	3.8	1	1.2	2.5	<0.69	<0.58	<0.75	1	<0.58	1.1	1.3	99	<1.4
Silver	110 4,100	11	4.2	3.4	5.5	<1.2	5.1	3.7	1.5	<1.2	2.1	<1.2	<1.2	1.2	5	<1.4	<2.8
Thallium	2 2	<1.2	<1.4	<1.4	<1.4	<1.2	<1.5	<1.2	<1.4	<1.2	<1.5	<1.2	<1.2	<1.2	<1.5	<1.4	<2.9
Zinc	1500 1,500	8,000	2,600	2,700	2,800	410	1,400	850	1,000	830	610	950	120	930	920	1,300	370

Parameter	NRDCSCC*	B-9, 1-2'	B-9, 9-11'	B-10, 1-2'	B-10, 11-	B-11, 1-2'	B-11, 17-	B-12, 1-2'	B-12, 8-	B-13, 1-2'	B-13, 9-11'	B-14, 1-2'	B-14, 7-9'	Field bla	Field bla	Field blank
Antimony	340	<2.4	13	3.3	<2.4	4	3.1	3.2	3.3	<2.4	9.2	<2.4	<3.3	<0.020	<0.020	<0.020
Arsenic	20	44	66	9.2	10	6.8	11	7.1	8.6	4	<2.8	8.4	6.7	<0.010	<0.010	<0.010
Beryllium	1	<0.60	<0.67	<0.64	<0.61	<0.62	<0.68	<0.66	<0.69	<0.61	<1.4	<0.61	0.83	<0.005	<0.005	<0.005
Cadmium	100	1.8	<0.67	3.6	29	5.9	3.1	5.5	40	2.1	7.8	1.6	3.3	<0.005	<0.005	<0.005
Chromium	-	76	45	69	78	36	100	84	140	110	72	55	82	<0.010	<0.010	<0.010
Copper	600	9,300	180	410	400	170	160	410	500	100	8,900	200	250	<0.020	<0.020	<0.020
Lead	600	460	4,000	1,300	1,200	860	740	2,000	1,300	480	1,400	710	860	0.011	<0.005	<0.005
Mercury	270	0.72	1	2.1	1.2	0.99	1.1	1.7	3.5	0.66	0.72	1.2	2.8	<0.0002	0.0042	<0.0002
Nickel	2,400	29	21	90	82	43	42	160	180	39	210	52	4.8	<0.040	<0.040	<0.040
Selenium	3,100	0.74	<0.67	0.77	0.67	<0.62	0.97	0.97	<0.69	0.68	<1.4	<0.60	1	<0.005	<0.005	<0.005
Silver	4,100	<1.2	1.3	<1.3	<1.2	3.1	<1.4	2.5	7.5	<1.2	3.9	<1.2	<1.7	<0.010	<0.010	<0.010
Thallium	2	<1.2	<1.3	<1.3	<1.2	<1.2	<1.4	<1.3	<1.4	<1.2	<2.8	<1.2	<1.7	<0.010	<0.010	<0.010
Zinc	1,500	1,200	510	3,300	61,000	590	890	990	1,800	260	6,400	390	3,000	<0.020	<0.020	<0.020

***Non-Residential Direct Contact Soil Cleanup Criteria**
(Values in ppm)

HARTZ1.WB1

TABLE 3.3 (CONT.)

Summary of TPHC, Cyanide and Total Phenols Soil Boring Sample Data
December 1988
Harrison Avenue Landfill Site
Kearny, New Jersey

Parameter	NJHWS*	B-1, 1-2'	B-1, 2-4'	B-2, 1-2'	B-2, 7-9'	B-3, 1-2'	B-3, 2-4'	B-4, 1-2'	B-4, 0-1	B-5, 1-2'	B-5, 14-16'	B-6, 1-2'	B-6, 17-1	B-7, 1-2'	B-7, 6-8'
TPHC	30,000	2,300	5,300	1,200	3,400	180	400	930	11,000	260	7,500	630	210	NA	NA
Cyanide		2.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.2	<2.7
Phenols		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.48	1.9

Parameter	NJHWS*	B-8, 1-2'	B-8, 5-7'	B-9, 1-2'	B-9, 9-11'	B-10, 1-2'	B-10, 11-	B-11, 1-2'	B-11, 1	B-12, 1-2'	B-12, 6-8'	B-13, 1-2'	B-13, 9-1	B-14, 1-2'	B-14, 7-9'	Field blank	Field blank	Field blank
TPHC	30,000	1,100	5,100	380	6,600	1,100	8,400	NA	NA	5,400	5,900	290	4,600	570	270	<1.0	<1.0	<1.0
Cyanide		NA	NA	NA	NA	NA	NA	<1.2	1.9	NA	NA	NA	NA	NA	NA	-	-	-
Phenols		NA	NA	NA	NA	NA	NA	<0.62	10	NA	NA	NA	NA	NA	NA	-	<0.010	-

***New Jersey Hazardous Waste Standard (ppm)**
NA = Not Analyzed
"-" = No blank required
(Values in ppm)

HARTZ1.WB1

TABLE 3.3 (CONT.)

Summary of PCB Soil Boring Sample Data
December 1988
Harrison Avenue Landfill Site
Kearny, New Jersey

Parameter	NRDCSCC	NJHWL	B-1, 1-2'	B-1, 2-4'	B-2, 1-2'	B-2, 7-9'	B-3, 1-2'	B-3, 2-4'	B-4, 1-2	B-4, 9-11'	B-5, 1-2'	B-5, 14-1	B-6, 1-2'	B-6, 17-1	B-7, 1-2'	B-7, 6-8'
PCB-1016			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248			ND	ND	20	ND	ND	ND	ND	62	ND	1	ND	ND	ND	ND
PCB-1254			ND	ND	ND	3.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260			13	12	6.2	ND	ND	ND	ND	ND	ND	ND	6.3	ND	ND	ND
PCBs	2	50	13	12	26.2	3.3	ND	ND	ND	62	ND	1	6.3	ND	ND	ND

Parameter	NRDCSCC	NJHWL	B-8, 1-2'	B-8, 5-7'	B-9, 1-2'	B-9, 9-11'	B-10, 1-2'	B-10, 11-	B-11, 1-	B-11, 17-19'	B-12, 1-2'	B-12, 6-8'	B-13, 1-2'	B-13, 9-1	B-14, 1-2'	B-14, 7-9'
PCB-1016			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248			ND	ND	ND	ND	ND	ND	ND	9.7	ND	ND	ND	ND	ND	ND
PCB-1254			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260			ND	ND	ND	ND	1.6	3.6	ND	ND	1.4	ND	ND	ND	ND	ND
PCBs	2	50	ND	ND	ND	ND	1.6	3.6	ND	9.7	1.4	ND	ND	ND	ND	ND

*Non-Residential Direct Contact Soil Cleanup Criteria (ppm)
*New Jersey Hazardous Waste List (ppm)
ND = Not detected above method detection limit
(Values in ppm)

TABLE 3.4

Summary of Volatile Organics Soil Boring Sample Data
May 1991
Harrison Avenue Landfill Site
Kearny, New Jersey

Parameter	NRDCSCC (PPM	B-22, 1-2'	B-22, 6-7'	B-23, 1-2'	B-23, 6-7'	B-24, 1-2'	B-24, 6-7'	B-25, 1-2'	B-26, 1	B-27, 1-2'	B-27, 6-7'
Chlorobenzene	680	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND
Ethylbenzene	1000	ND	ND	0.007	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	210	ND	ND	0.007	0.025	0.01	ND	ND	ND	ND	ND
Tetrachloro-ethylene	6	ND	ND	0.029	ND	0.014	0.026	ND	ND	ND	ND
Toluene	1000	ND	ND	0.008	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethylene	1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	54	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloro-fluoromethane	NA										

Parameter	NRDCSCC (PPM	B-28, 1-2'	B-28, 3-4'	TP4	TP5	TP6	TP8	TP9
Chlorobenzene	680	ND	ND	ND	ND	ND	0.17	0.17
Ethylbenzene	1000	ND	420	ND	ND	ND	ND	ND
Methylene Chloride	210	ND	8.7	ND	0.007	ND	ND	ND
Tetrachloro-ethylene	6	ND	ND	ND	ND	ND	ND	ND
Toluene	1000	11	1.7	ND	ND	ND	ND	ND
1,1-Dichloroethane	1000	16	8.6	ND	ND	ND	ND	ND
1,2-Dichloroethylene	1000	440	10	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1200	9	ND	ND	ND	ND	ND	ND
Trichloroethylene	54	110	1100	ND	ND	ND	ND	ND
Trichloro-fluoromethane	NA	0.17						

ND = Not Detected
***Non-Residential Direct Contact Soil Cleanup Criteria**
(Values in ppm)

HARTZ1.WB1

TABLE 3.4 (CONT.)

Summary of PCB Soil Boring Sample Data
May 1991
Harrison Avenue Landfill Site
Kearny, New Jersey

Parameter	NRDCSCC (P	B-4A, 9-1	B-4B, 9-1	B-4C, 9-1	B-4D, 9-1	B-21, 1-2'	B-21, 5-6'	B-22, 1-2'	B-22, 6-	B-23, 1-2'	B-23, 6-7'	B-24, 1-2'	B-24, 6-7'	B-25, 1-2'	B-25, 11-
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	19	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	36	0.65	3	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	14	890	10	6.4	10	0.42	0.98	0.1	0.91	10	0.52	0.64	0.3	0.24
Total PCBs	50	1.4	890	10	6.4	10	0.42	20	0.2	2.3	46	1.2	3.6	0.3	0.2

ND = Not Detected

Parameter	NRDCSCC (P	B-26, 1-2'	B-26, 15-	B-27, 1-2'	B-27, 6-7'	B-28, 1-2'	B-28, 3-4'	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP9	TP10
PCB-1016	ND	ND	1.5	ND	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	2500	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.2	1.6	ND	1	nd	1.5	ND	ND
PCB-1254	ND	ND	ND	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	0.43	0.4	ND	6.5	4.2	ND	ND	ND	1.1	1.1	0.75	1.9	3.2	0.39	0.97	ND
Total PCBs	50	0.4	1.9	3.9	8.3	4.2	0	0	0	3.3	2.7	0.8	2.9	5.7	1.9	3.5	0

ND = Not Detected
*Non-Residential Direct Contact Soil Cleanup Criteria
(Values in ppm)

HARTZ1.WB1

TABLE 3.4 (CONT.)

Summary of Base/Neutral Extractable Soil Boring Sample Data
May 1991
Harrison Avenue Landfill Site
Kearny, New Jersey

Parameter	NRDCSCC (PPM	B-21, 1-2'	B-22, 1-2'	B-23, 1-2'	B-23, 6-7'	B-24, 1-2'	B-25, 11-	B-26, 1-2'	B-26, 1	B-28, 1-2'	B-28, 3-4'
bis(2-ethylhexyl) phthalate	210	6.9	14	2.7	50	65	3.1	26	22	98	290
Diethyl phthalate	10000	ND	0	1.1	ND	ND	ND	ND	ND	ND	ND
Di-n-Octyl phthalate	10000	ND	0	2.8	ND	ND	ND	ND	ND	ND	ND
Butylbenzyl phthalates	10000	ND	ND	ND	ND	ND	ND	ND	ND	25	111
Dimethyl phthalate	10000	ND	ND	ND	ND	ND	ND	ND	ND	ND	73
Di-n-Butyl phthalate	10000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	10000	ND	ND	ND	ND	ND	0.94	ND	ND	42	ND
Phenanthrene	-	ND	ND	ND	ND	ND	ND	ND	ND	34	ND
Pyrene	10000	ND	ND	ND	ND	ND	1	ND	ND	34	ND
Total PAHs	?	ND	ND	ND	ND	ND	1.94	ND	ND	110	ND

ND = Not Detected

Parameter	NRDCSCC (PPM	TP1	TP2	TP4	TP6	TP7	TP8	TP9	TP10
bis(2-ethylhexyl) phthalate	210	1	36	12	4.9	14	9.1	290	190
Diethyl phthalate	10000	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-Octyl phthalate	10000	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzyl phthalates	10000	ND	34	ND	ND	ND	ND	ND	120
Dimethyl phthalate	10000	ND	16	ND	ND	ND	ND	ND	730
Di-n-Butyl phthalate	10000	ND	15	ND	ND	ND	ND	ND	ND
Fluoranthene	10000	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	-	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	10000	ND	ND	ND	ND	ND	ND	ND	ND
Total PAHs	?	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected

*Non-Residential Direct Contact Soil Cleanup Criteria
(Values in ppm)

TABLE 3.5

HARTZ MOUNTAIN INDUSTRIES

Harrison Avenue Landfill
1991 Cortell PCB Sampling (Area of 1988 B-4)

Sample Number	Sample Depth	PCB Result (ppm)
B-4(a)	9'-11'	14
B-4(b)	9'-11'	890
B-4(c)	9'-11'	10
B-4(d)	9'-11'	6.4

TABL

Summary of Leachate Data-Metals

June 1991
Harrison Avenue Landfill Site
Kearny, New Jersey

Parameter	*GWQS	MW-21	MW-22	MW-23	MW-24	MW-25	MW-26	MW-27	MW-28	Field blank
Antimony	20	ND	25	ND	ND	ND	ND	ND	ND	ND
Arsenic	8	11	750	28	33	110	43	24	40	ND
Beryllium	20	ND	ND	ND	ND	6	ND	ND	ND	ND
Cadmium	4	ND	83	14	10	65	8	20	31	ND
Chromium	100	90	62	56	38	72	34	31	79	ND
Copper	1000	170	3600	730	1900	2200	860	1300	1000	ND
Iron	300	120000	320000	210000	250000	320000	280000	140000	180000	ND
Lead	10	450	13000	2900	6900	7300	2600	5600	5000	ND
Manganese	50	2000	2500	1400	1400	1600	1600	1000	1500	ND
Mercury	2	2	37	4	4	18	4	5	20	ND
Nickel	100	120	1000	220	300	1300	240	230	1600	ND
Selenium	50	ND	ND	ND	ND	ND	ND	ND	9	ND
Silver	20	14	48	19	31	22	18	41	ND	ND
Sodium	50000	420000	52000	40000	40000	140000	37000	88000	720000	ND
Thallium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	5000	600	22000	6000	5100	15000	4400	3500	7300	ND

(Values in ppb)
ND = Not Detected
* New Jersey Groundwater Quality Standards (ppb)

TABLE 3.6 (CONT.)

Summary of Leachate Data– VOCs

June 1991

Harrison Avenue Landfill

Kearny, New Jersey

	GWQS (ppb)	MW-21	MW-22	MW-23	MW-24	MW-25	MW-26	MW-27	MW-28	Field blank	Field blank
1,1-Dichloroethylene	2	21	ND	ND	ND	ND	ND	ND	9800	ND	ND
Benzene	1	ND	ND	9	ND	ND	9	6	300	ND	ND
Ethylbenzene	700	ND	ND	6	ND	ND	ND	ND	1000	ND	ND
Toluene	1000	ND	ND	6	ND	ND	ND	ND	9600	ND	ND
Chlorobenzene	4	ND	ND	ND	ND	ND	29	55	110	ND	ND
Chloroethane		ND	ND	ND	ND	ND	ND	ND	700	ND	ND
Chloroform	6	ND	ND	ND	ND	ND	ND	ND	120	ND	ND
1,1-Dichloroethane	70	ND	ND	ND	ND	ND	ND	ND	540	ND	ND
Methylene Chloride	2	ND	ND	ND	ND	ND	ND	ND	270	ND	ND
1,1,1-Trichloro-ethane	30	ND	ND	ND	ND	ND	ND	ND	100	ND	ND
Trichloroethylene	1	ND	ND	ND	ND	ND	ND	ND	54	ND	ND
Vinyl chloride	5	ND	ND	ND	ND	ND	ND	ND	810	ND	ND

ND = Not detected

*New Jersey Groundwater Quality Standard

(Values in ppb)

TABLE 6 (CONT.)

Summary of Leachate Data- TPHCs

June 1991
Harrison Avenue Landfill
Kearny, New Jersey

Parameter	GWQS*	MW-21	MW-22	MW-23	MW-24	MW-25	MW-26	MW-27	MW-28	Field blank
TPHC	none noticable	ND	ND	2.8	ND	11	2.9	ND	9	ND

*New Jersey Groundwater Quality Standard
(Values in ppm)

TABLE 3.6 (CONT.)

Summary of Leachate Data- pH & Conductivity

June 1991

Harrison Avenue Landfill

Kearny, New Jersey

Parameter	MW-21	MW-22	MW-23	MW-24	MW-25	MW-26	MW-27	MW-28	Field blank
pH	6.4	6.7	6.5	6.6	6.7	6.5	6.8	6.9	5.7
Conductivity (umhos/cm)	3,000	1,800	1,700	1,900	2,800	1,800	2,000	5,900	0

TABLE 7
Summary of Test Pit Sample Data
September 1995 Envirotech Investigation
Harrison Avenue Landfill

Sample ID	NJHWS	E4-A	E4-B	45-A	E5-B	E6-A	E6-B
Sample Depth		4'	12'	4'	12'	4'	9'
TCLP Metals (ppm)							
Arsenic	5	ND	0.05	ND	ND	ND	ND
Barium	100	1.3	1.33	0.91	0.07	1.35	2.11
Cadmium	1	0.01	ND	0.02	ND	0.04	ND
Chromium	5	ND	ND	ND	ND	ND	0.03
Lead	5	0.36	0.11	0.37	ND	0.16	0.18
Mercury	0.2	0.001	ND	ND	ND	ND	0.001
Selenium	1	ND	ND	ND	ND	ND	ND
Silver	5	ND	ND	ND	ND	ND	ND
pH	<2 or >12.5	6.59	8.36	7.23	7.75	6.79	7.46
Reactive Cyanide		ND	ND	ND	ND	ND	ND
Reactive Sulfide		ND	ND	ND	ND	25	ND
TPH (ppm)	30,000.	570	3,170	490	580	3,065	30,330
% Solids	?	92	73.7	78.9	60.4	60.3	44.7
Flashpoint	>140 F	>140 F	>140 F	>140 F	>140 F	>140 F	>140 F
PCB-1016		ND	ND	ND	ND	ND	ND
PCB-1221		ND	ND	ND	ND	ND	ND
PCB-1232		ND	ND	ND	ND	ND	ND
PCB-1242		ND	ND	ND	ND	1.38	4.2
PCB-1248		ND	ND	ND	ND	ND	ND
PCB-1254		ND	ND	1.935	ND	1.69	2.43
PCB-1260		ND	ND	ND	ND	ND	ND
Total PCBs (ppm)	50	ND	ND	1.935	ND	3.07	6.63

ND = Not Dectected
*New Jersey Hazardous Waste Standard
(Values in ppm)

HARTZ1.WB1

TABLE 3.7 (CONT.)

Summary of Test Pit Sample Data
September 1995 Envirotech Investigation
Harrison Avenue Landfill

Sample ID	NJHWS	E7-A	E7-B	E8-A	E8-B	E9-A	E9-B
Sample Depth		4'	11.5'	4'	10'	4'	10'
TCLP Metals (ppm)							
Arsenic	5	ND	0.05	ND	ND	ND	ND
Barium	100	1.1	2.15	2	1.04	5.47	2.27
Cadmium	1	0.04	ND	0.02	ND	ND	ND
Chromium	5	ND	ND	ND	ND	ND	ND
Lead	5	0.29	0.34	0.97	0.04	0.09	0.23
Mercury	0.2	0.002	0.002	0.001	0.002	0.001	0.002
Selenium	1	ND	ND	ND	ND	ND	ND
Silver	5	ND	ND	ND	ND	ND	ND
pH	<2 or >12.5	7.15	6.96	6.33	6.94	7.54	7.27
Reactive Cyanide		ND	ND	ND	ND	ND	ND
Reactive Sulfide		ND	33	ND	24	31	ND
TPH (ppm)	30,000	2085	4310	7,025	3,600	620	595
% Solids	?	79.3	45.2	39.8	62.8	47.8	65.3
Flashpoint	>140F	>140 F	>140 F	>140 F	>140 F	>140 F	>140 F
PCB-1016		ND	ND	ND	ND	ND	ND
PCB-1221		ND	ND	ND	ND	ND	ND
PCB-1232		ND	ND	ND	ND	ND	ND
PCB-1242		ND	3.55	ND	0.93	ND	ND
PCB-1248		ND	ND	ND	ND	ND	ND
PCB-1254		ND	ND	ND	ND	ND	ND
PCB-1260		ND	ND	ND	ND	ND	ND
Total PCBs (ppm)	50	ND	ND	ND	0.93	ND	ND

ND = Not Dectected
*New Jersey Hazardous Waste Standard
(Values in ppm)

TABLE ..7 (CONT.)

Summary of Test Pit Sample Data
September 1995 Envirotech Investigation
Harrison Avenue Landfill

Sample ID	NJHWS	E10-A	E10-B	E11-A	E11-B	E12-A	E12-B
Sample Depth		4'	7'	4'	11'	4'	11'
TCLP Metals (ppm)							
Arsenic	5	ND	ND	ND	ND	ND	ND
Barium	100	2.46	2.31	0.86	1.22	0.23	0.33
Cadmium	1	ND	0.03	0.02	ND	0.06	ND
Chromium	5	ND	ND	0.03	ND	ND	ND
Lead	5	0.19	0.24	0.16	0.15	0.21	0.1
Mercury	0.2	0.002	ND	-	-	-	-
Selenium	1	ND	ND	ND	ND	ND	ND
Silver	5	ND	ND	ND	ND	ND	ND
pH	<2 or >12.5	6.91	6.99	6.99	7.37	6.64	7.09
Reactive Cyanide		ND	ND	ND	ND	ND	ND
Reactive Sulfide		49	ND	ND	ND	ND	ND
TPH (ppm)	30,000	955	1,720	6.45	490	760	485
% Solids	?	44.7	90.7	88	44	80.5	70.5
Flashpoint	>140F	>140 F	>140 F	>140 F	>140 F	>140 F	>140 F
PCB-1016		ND	ND	ND	ND	ND	ND
PCB-1221		ND	ND	ND	ND	ND	ND
PCB-1232		ND	ND	ND	ND	ND	ND
PCB-1242		0.76	ND	ND	ND	ND	ND
PCB-1248		ND	ND	ND	ND	ND	ND
PCB-1254		ND	ND	ND	ND	ND	ND
PCB-1260		ND	ND	ND	ND	3.785	2.96
Total PCBs (ppm)	50	0.76	ND	ND	ND	3.785	2.96

"-" = not defined in lab report?
ND = Not Dectected
*New Jersey Hazardous Waste Standard
(Values in ppm)

TABLE 4.2
[illegible]TZ MOUNTAIN

[illegible]son Avenue Landfill
[illegible]ary of PCB "Hot Spot" Soil Delineation
[illegible]ber 13, 1995

Date	Sample #	Client ID #	Parameter	Concentration MG/KG
12/13/95	68205	P-1(3 -5')	PCB-1016	< 0.005
			PCB-1221	< 0.013
			PCB-1232	< 0.004
			PCB-1242	< 0.011
			PCB-1248	< 0.005
			PCB-1254	0.28
			PCB-1260	< 0.008
			TOTAL PCB	0.272
12/13/95	68206	P-1 (9')	PCB-1016	< 0.061
			PCB-1221	< 0.160
			PCB-1232	< 0.050
			PCB-1242	< 0.132
			PCB-1248	< 0.066
			PCB-1254	< 0.061
			PCB-1260	< 0.094
			TOTAL PCB	ND
12/13/95	68207	P-2 (3')	PCB-1016	< 0.010
			PCB-1221	< 0.025
			PCB-1232	< 0.008
			PCB-1242	< 0.021
			PCB-1248	1.14
			PCB-1254	< 0.010
			PCB-1260	< 0.015
			TOTAL PCB	1.14
12/13/95	68208	P-2 (9')	PCB-1016	< 0.029
			PCB-1221	< 0.075
			PCB-1232	< 0.023
			PCB-1242	< 0.062
			PCB-1248	< 0.031
			PCB-1254	< 0.029
			PCB-1260	< 0.044
			TOTAL PCB	ND
12/13/95	68209	P-3 (3')	PCB-1016	< 0.004
			PCB-1221	< 0.011
			PCB-1232	< 0.004
			PCB-1242	< 0.009
			PCB-1248	< 0.005
			PCB-1254	< 0.004
			PCB-1260	< 0.007
			TOTAL PCB	ND
12/13/95	68210	P-3(9')	PCB-1016	< 0.014
			PCB-1221	< 0.036
			PCB-1232	< 0.011
			PCB-1242	< 0.030
			PCB-1248	< 0.015
			PCB-1254	< 0.014
			PCB-1260	< 0.021
			TOTAL PCB	ND

The New Jersey Hazardous Waste Level for PCBs is 50 ppm.

HARTZ1.WQ1

TABLE 4.3

Harrison Avenue Landfill
Results of TPHC Delineation Sampling
December 1995 & February 1996

Sample #	Sample Date	Result (ppm)
TPH-1(3')	12/12/95	160
TPH-1(7')	12/12/95	1,305
TPH-1(9')	12/12/95	1,665
TPH-2(3')	12/12/95	275
TPH-2(8')	12/12/95	1,515
TPH-3(5')	12/12/95	1,130
TPH-3(9')	12/12/95	2,015
TPH-4(4')	12/12/95	19,760
TPH-4(10.5')	12/12/95	4,710
TPH-5(3')	12/12/95	1,670
TPH-5(8')	12/12/95	1,365
TPH-6(4')	12/12/95	850
TPH-6(8')	12/12/95	740
TPH-7(4')	12/12/95	390
TPH-7(9')	12/12/95	105,810
TPH-8(4')	12/12/95	17,315
TPH-8(9')	12/12/95	16,570
TPH-9(3')	12/13/95	445
TPH-9(15')	12/13/95	720
TPH-10(4')	12/13/95	485
TPH-10(14')	12/13/95	1,030
TPH-11(4')	12/13/95	765
TPH-11(12')	12/13/95	1,165
TPH-12(10')	12/13/95	395
TPH-12(4')	12/13/95	40
TPH-13(4')	2/5/96	1,160
TPH-13(10')	2/5/96	28,310
TPH-14(4')	2/5/96	8,960
TPH-14(10')	2/5/96	26,535
TPH-15(4')	2/5/96	5,940
TPH-15(10')	2/5/96	610
TPH-16(4')	2/5/96	185
TPH-16(10')	2/5/96	8,430

TABLE 4.5

HARTZ MOUNTAIN

Harrison Avenue Landfill Remedial Investigation

2/22/96 Leachate Sample Data

SAMPLE ID LAB ID PARAMETER	NJDEP Groundwater Quality Standards	MW-B-21 69475	MW-B-22 69474	MW-B-23 69473	MW-B-24 69472	MW-B-26 69471	MW-B-27 69470	MW-B-28 69469
(results in ppm)								
Ammonia - Nitrogen	0.5	16.5	8.3	42.3	51.1	14.2	56.8	95
Nitrite - Nitrogen	1	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate - Nitrogen	10	0.79	0.43	0.1	0.5	0.13	0.15	0.16
BOD	NS	14.9	4.8	26.3	8.9	19.3	13.3	88
COD	NS	184	94	167	130	143	113	168
Sulfate	250	67.2	369	20.4	33.8	60.3	29.1	46.8
TPHC	none noticable	0.33	0.3	1.74	0.31	0.31	0.3	1.97
Oil/Grease	none noticable	1	1	3.3	1	2.6	2.2	2.6
Total Solids	NS	3460	1280	2100	1100	1070	860	1180
Total Suspended Solids	NS	1930	35	475	65	71	75	117
Chloride	250	140	24	25	24	27	20	36
TKN	NS	49	17	87	83	55	83	130
TOC	NS	50	39	57	43	57	41	52

'ABLE 4.7.

{ARTZ MOUNTAIN

'arrison Avenue Landfill Remedial Investigation

{egional Unconfined Aquifer Sampling Data

AMPLE ID / AB ID / ATE / ARAMETER	NJDEP Groundwater Quality Standards	MWD-1 69468 2/22/96	MWD-1 69959 3/18/96	MWD-2 69467 2/22/96	MWD-2 69960 3/18/96	MWD-3 69465 2/22/96	MWD-3 69961 3/18/96
results in ppm)							
'otal Cyanide		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
'henol	4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
\mmonia - Nitrogen	0.5	4	13.1	11.6	15.7	31.7	31.6
Vitrite - Nitrogen	1	0.03	NA	< 0.01	NA	0.02	NA
Vitrate - Nitrogen	10	0.18	NA	0.21	NA	0.22	NA
3OD	NS	48	NA	4.8	NA	16.1	NA
⊃OD	NS	279	NA	194	NA	335	NA
3ulfate	250	68.1	NA	26.5	NA	46.8	NA
'PHC	none noticable	< 0.33	NA	< 0.33	NA	< 0.35	NA
Dil/Grease	none noticable	1.1	NA	4.7	NA	< 1	NA
Total Solids	NS	1910	NA	2440	NA	40800	NA
Total Suspended Solids	NS	580	60	360	128	20350	2875
Chloride	250	180	NA	290	NA	1000	NA
TKN	NS	11	NA	17	NA	46	NA
TOC	NS	43	NA	45	NA	67	NA

(CONT)
...NTAIN
... Landfill Remedial Investigation
...fined Aquifer Sampling Data

NJDEP Groundwater Quality Standards		MWD-1 69468 2/22/96		MWD-1 69959 3/18/96		MWD-2 69467 2/22/96		MWD-2 69960 3/18/96		MWD-3 69465 2/22/96		MWD-3 69961 3/18/96	
20	<	2	<	2	<	2	<	2	<	2	<	2	Sb
8	<	5	<	5	<	5		18	<	5		11	AS
20		2	<	1		1		1		46	<	1	BE
4		12		13		22		14		27		12	CD
100		24	<	5		27	<	5		511	<	5	CR
1000	<	10		39		53		20		969		27	CU
10		16		9		29		20		564		6	Pb
2	<	0.3	<	0.3	<	0.3	<	0.3	<	0.3	<	0.3	HG
100		115		70		179		96		1125		110	NI
50	<	3	<	3	<	3	<	3	<	3	<	3	SE
20	<	20	<	20	<	20	<	20		30	<	20	AG
10	<	1	<	1	<	1	<	1	<	1	<	1	Th
5000		208		344		10		127		2418		130	ZN

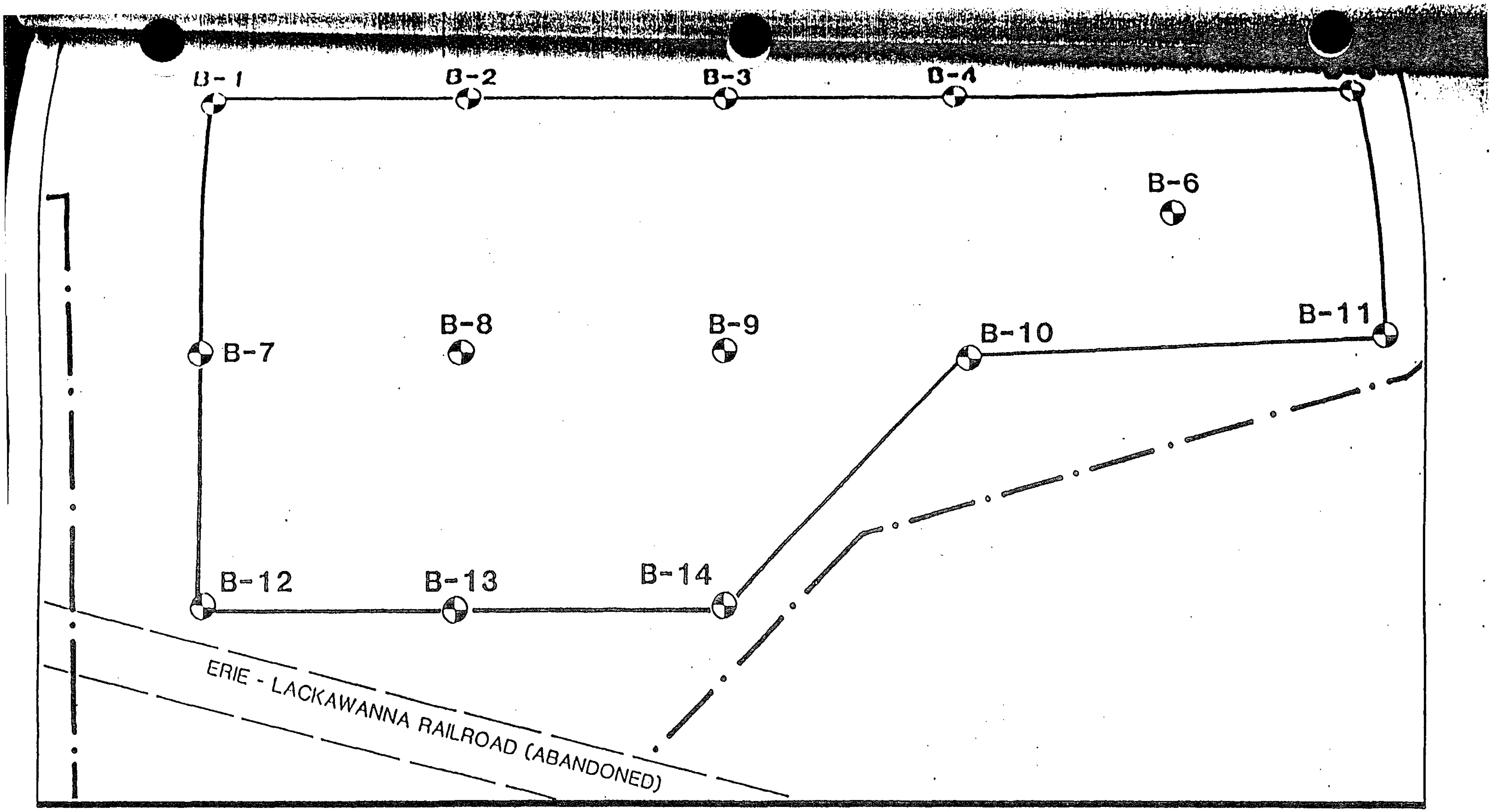
...CCB.wq1

HARTZ®
HARTZ MOUNTAIN INDUSTRIES

ENVIRONMENTAL EVALUATION

KEARNY LANDFILL SITE
Harrison Avenue
Kearny, New Jersey

CORTELL
ASSOCIATES



KEARNY LANDFILL SITE BOUNDARY
PARCEL OF INTEREST BOUNDARY
B-1 BORING LOCATION

SOIL BORINGS
December 1988

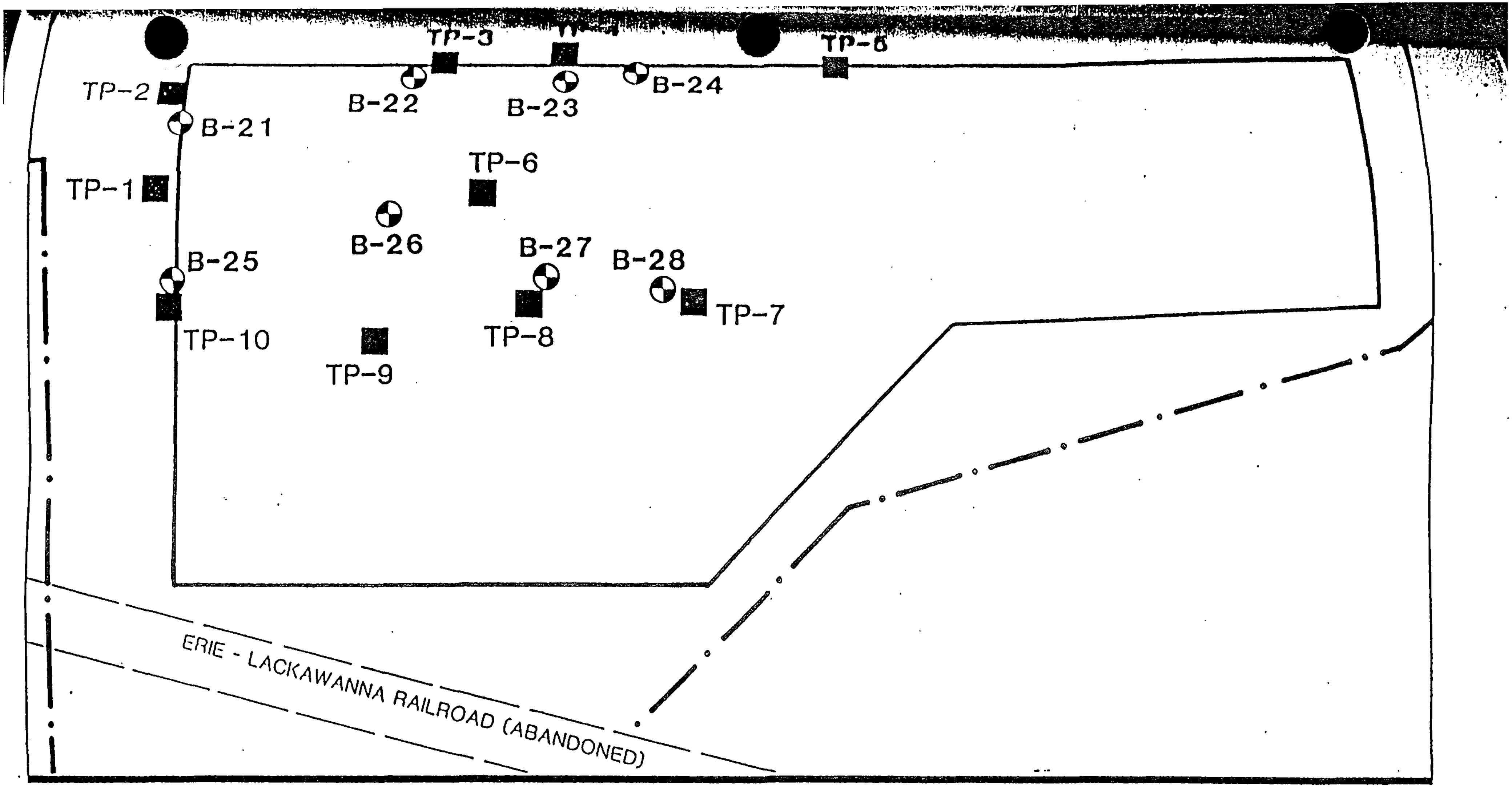
HARTZ
HARTZ MOUNTAIN INDUSTRIES

ENVIRONMENTAL EVALUATION
KEARNY LANDFILL SITE
Harrison Avenue
Kearny, New Jersey

SCALE
0' 77' 154'

FIGURE
2-1

CORTELL ASSOCIATES



KEARNY LANDFILL SITE BOUNDARY
PARCEL OF INTEREST BOUNDARY
B-20 BORING LOCATION
TP-1 TEST PIT LOCATION

SOIL BORINGS AND TEST PITS
May 1991

HARTZ

ENVIRONMENTAL EVALUATION
KEARNY LANDFILL SITE
Harrison Avenue
Kearny, New Jersey

SCALE
0' 77' 154'

FIGURE
2-2

CORTELL ASSOCIATES

PRIORITY POLLUTANT METALS IN SOILS
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
DECEMBER 1988

	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
	14	20	2	3	240	600	400	14	250	63	110	2	1500
B-1, 1-2'	16	12	4.4	12	280	2,800	3,800	7.2	210	1.5	11	<1.2	8,000
B-1, 2-4'	13	12	0.87	21	200	700	3,000	7.5	520	1.7	4.2	<1.4	2,500
B-2, 1-2'	5.6	16	<0.71	14	120	1,000	2,700	4.6	120	2.3	3.4	<1.4	2,700
B-2, 7-9'	5.9	20	1.2	25	220	930	6,500	1.2	110	3.8	5.5	<1.4	2,800
B-3, 1-2'	2.8	5.9	<0.62	<0.62	29	170	690	0.72	25	1.0	<1.2	<1.2	410
B-3, 2-4'	3.2	9.8	0.92	18	65	370	2,900	0.92	40	1.2	5.1	<1.5	1,400
B-4, 1-2'	<2.5	7.6	<0.62	14	47	180	1,400	1.3	63	2.5	3.7	<1.2	850
B-4, 9-11'	12	5.8	<0.69	<0.69	99	670	2,900	1.5	42	<0.69	1.5	<1.4	1,000
B-5, 1-2'	3.5	3.1	<0.58	3.2	120	420	910	0.70	45	<0.58	<1.2	<1.2	830
B-5, 14-16'	16	64	0.90	3.9	160	180	1,800	0.34	120	<0.75	2.1	<1.5	610
B-6, 1-2'	4.4	12	<0.62	8.1	110	400	1,200	2.0	56	1.0	<1.2	<1.2	950
B-6, 17-19'	<2.3	1.6	<0.58	<0.58	16	31	160	0.30	19	<0.58	<1.2	<1.2	120
B-7, 1-2'	3.1	8.2	<0.60	8.0	99	260	2,000	5.3	83	1.1	1.2	<1.2	930
B-7, 6-8'	3.5	11	<0.76	12	110	230	2,100	<0.076	94	1.3	5.0	<1.5	920
B-8, 1-2'	6.8	8.0	0.68	6.7	78	810	820	3.0	63	99	<1.4	<1.4	1,300
B-8, 5-7'	<5.7	<2.9	<1.4	2.8	12	120	94	5.7	<11	<1.4	<2.8	<2.9	370
B-9, 1-2'	<2.4	44	<0.60	1.8	76	9,300	460	0.72	29	0.74	<1.2	<1.2	1,200
B-9, 9-11'	13	55	<0.67	<0.67	45	180	4,000	1.0	21	<0.67	1.3	<1.3	510
B-10, 1-2'	3.3	9.2	<0.64	3.6	69	410	1,300	2.1	90	0.77	<1.3	<1.3	3,300
B-10, 11-13'	<2.4	10	<0.61	29	78	400	1,200	1.2	82	0.67	<1.2	<1.2	51,000
B-11, 1-2'	4.0	6.8	<0.62	5.9	36	170	860	0.99	43	<0.62	3.1	<1.2	590
B-11, 17-19'	3.1	11	<0.68	3.1	100	160	740	1.1	42	0.97	<1.4	<1.4	890
B-12, 1-2'	3.2	7.1	<0.66	5.5	84	410	2,000	1.7	160	0.97	2.5	<1.3	990
B-12, 6-8'	3.3	8.6	<0.69	40	140	500	1,300	3.5	180	<0.69	7.5	<1.4	1,800
B-13, 1-2'	<2.4	4.0	<0.61	2.1	110	100	480	0.66	39	0.68	<1.2	<1.2	260
B-13, 9-11'	9.2	<2.8	<1.4	7.8	72	8,900	1,400	0.72	210	<1.4	3.9	<2.8	6,400
B-14, 1-2'	<2.4	8.4	<0.61	1.6	55	200	710	1.2	52	<0.60	<1.2	<1.2	390
B-14, 7-9'	<3.3	6.7	0.83	3.3	82	250	850	2.8	4.8	1.0	<1.7	<1.7	3,000
Field Blank	<0.020	<0.010	<0.005	<0.005	<0.010	<0.020	0.011	<0.0002	<0.040	<0.005	<0.010	<0.010	<0.020
Field Blank	<0.020	<0.010	<0.005	<0.005	<0.010	<0.020	<0.005	0.0042	<0.040	<0.005	<0.010	<0.010	<0.020
Field Blank	<0.020	<0.010	<0.005	<0.005	<0.010	<0.020	<0.005	<0.0002	<0.040	<0.005	<0.010	<0.010	<0.020

All results are in parts per million (ppm).

Samples were collected and analyzed by International Technology Corporation, Edison, New Jersey.

Table 2-II

PETROLEUM HYDROCARBONS, CYANIDE, AND PHENOLS IN SOILS
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
DECEMBER 1988

	Petroleum Hydrocarbons	Cyanide	Phenols (Total)
B-1, 1-2'	2,300	2.7	NA
B-1, 2-4'	5,300	NA	NA
B-2, 1-2'	1,200	NA	NA
B-2, 7-9'	3,400	NA	NA
B-3, 1-2'	180	NA	NA
B-3, 2-4'	400	NA	NA
B-4, 1-2'	930	NA	NA
B-4, 9-11'	11,000	NA	NA
B-5, 1-2'	260	NA	NA
B-5, 14-16'	7,500	NA	NA
B-6, 1-2'	630	NA	NA
B-6, 17-19'	210	NA	NA
B-7, 1-2'	NA	<1.2	0.48
B-7, 6-8'	NA	<2.7	1.9
B-8, 1-2'	1,100	NA	NA
B-8, 5-7'	5,100	NA	NA
B-9, 1-2'	380	NA	NA
B-9, 9-11'	6,600	NA	NA
B-10, 1-2'	1,100	NA	NA
B-10, 11-13'	8,400	NA	NA
B-11, 1-2'	NA	<1.2	<0.62
B-11, 17-19'	NA	1.9	10
B-12, 1-2'	5,400	NA	NA
B-12, 6-8'	5,900	NA	NA
B-13, 1-2'	290	NA	NA
B-13, 9-11'	4,600	NA	NA
B-14, 1-2'	570	NA	NA
B-14, 7-9'	270	NA	NA
Field Blank	<1.0	—	—
Field Blank	<1.0	—	<0.010
Field Blank	<1.0	—	—

NA = Not analyzed.
— = No blank required.

All results are in parts per million (ppm).

Samples were collected and analyzed by International Technology Corporation, Edison, New Jersey.

PCBs IN SOILS
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
DECEMBER 1988

.49

	PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260	Total PCBs (ppm)
B-1, 1-2'	--	--	--	--	--	--	13,000	13.0
B-1, 2-4'	--	--	--	--	--	--	12,000	12.0
B-2, 1-2'	--	--	--	--	20,000	--	6,200	26.2
B-2, 7-9'	--	--	--	--	--	3,300	--	3.3
B-3, 1-2'	--	--	--	--	--	--	--	--
B-3, 2-4'	--	--	--	--	--	--	--	--
B-4, 1-2'	--	--	--	--	--	--	--	--
B-4, 9-11'	--	--	--	--	62,000	--	--	62.0
B-5, 1-2'	--	--	--	--	--	--	--	
B-5, 14-16'	--	--	--	--	1,000	--	--	1.0
B-6, 1-2'	--	--	--	--	--	--	6,300	6.3
B-6, 17-19'	--	--	--	--	--	--	--	--
B-7, 1-2'	--	--	--	--	--	--	--	--
B-7, 6-8'	--	--	--	--	--	--	--	--
B-8, 1-2'	--	--	--	--	--	--	--	--
B-8, 5-7'	--	--	--	--	--	--	--	--
B-9, 1-2'	--	--	--	--	--	--	--	--
B-9, 9-11'	--	--	--	--	--	--	--	--
B-10, 1-2'	--	--	--	--	--	--	1,600	1.6
B-10, 11-13'	--	--	--	--	--	--	3,600	3.6
B-11, 1-2'	--	--	--	--	--	--	--	--
B-11, 17-19'	--	--	--	--	9,700	--	--	9.7
B-12, 1-2'	--	--	--	--	--	--	1,400	1.4
B-12, 6-8'	--	--	--	--	--	--	--	--
B-13, 1-2'	--	--	--	--	--	--	--	--
B-13, 9-11'	--	--	--	--	--	--	--	--
B-14, 1-2'	--	--	--	--	--	--	--	--
B-14, 7-9'	--	--	--	--	--	--	--	--

-- = *Not detected.*

Results are in parts per billion (ppb); totals are in parts per million (ppm).

Samples were collected and analyzed by International [illegible]

Table 2-V

BASE/NEUTRAL EXTRACTABLE COMPOUNDS IN SOILS
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
DECEMBER 1988

	bis(2-ethylhexyl) phthalate	Di-n-butyl phthalate	Anthracene	Benzo(a) anthracene	Benzo(b) fluoranthene	Chrysene	Fluorenthene	Phenanthane	Pyrene	Total PAH
B-1, 1-2'	--	--	--	--	--	--	--	--	--	0
B-1, 2-4'	20,000	27,000	--	--	--	--	--	--	--	0
B-2, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-2, 7-9'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3, 2-4'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4, 9-11'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5, 14-16'	72,000	--	--	--	--	--	--	--	--	0
B-6, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6, 17-19'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-7, 1-2'	--	--	--	--	--	--	--	--	--	0
B-7, 6-8'	--	--	--	--	--	--	--	--	--	0
B-8, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8, 5-7'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-9, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-9, 9-11'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-10, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-10, 11-13'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-11, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-11, 17-19'	12,000	--	--	--	--	--	--	--	--	0
B-12, 1-2'	70,000	--	--	--	--	--	--	--	--	0
B-12, 6-8'	--	--	40,000	44,000	36,000	42,000	100,000	110,000	100,000	472,000
B-13, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-13, 9-11'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-14, 1-2'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-14, 7-9'	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

-- = Not detected.
NA = Not analyzed.

All results are in parts per billion (ppb).

Samples were collected and analyzed by International Technology Corporation, Edison, New Jersey.

Table 2

PRIORITY POLLUTANT METALS IN SOILS
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
MAY 1991

	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
	14	20	2	39	290	600	400	14	250	63	110	2	1500
B-21, 1-2 ft	--	18	2.0	26	180-560	1,600	3,200	5.1-19	180	2.4	4.8	--	4,900
B-21, 5-6 ft	13	24	--	9.6	170	57	750	0.80	66	--	21	--	710
B-22, 1-2 ft	--	10	--	18	200	510	1,000	1.1	130	--	7.9	--	1,300
B-22, 6-7 ft	--	8.2	0.79	2.7	33	30	130	0.12-1.5	41	--	--	--	370
B-23, 1-2 ft	2.6	5.5	--	18	170	1,000	1,100	0.95	220	--	13	--	1,400
B-23, 6-7 ft	--	15	4.4	21	210	1,600	1,500	1.9	210	--	12	--	3,400
B-24, 1-2 ft	--	16	--	17	130	360	4,000	2.0	77	9.5	16	--	2,000
B-24, 6-7 ft	8.0	17	--	6.1	110	9,900	1,400	2.0	110	--	26	--	1,600
B-25, 1-2 ft	--	--	--	0.97	54	64	8.4	0.88	9.0	--	1.8	--	150
B-25, 11-12 ft	--	--	--	1.2	6.2	22	--	1.0	23	0.74	1.8	--	160
B-26, 1-2 ft	--	--	--	22	86	300	13	3.2	63	--	--	--	530
B-26, 15-17 ft	4.2	--	--	--	--	--	18	--	--	--	2.9	--	8.8
B-27, 1-2 ft	--	--	--	--	--	10	43	1.7	--	--	1.7	--	13
B-27, 6-7 ft	--	--	--	--	--	7.0	1.9	23	--	--	2.2	--	5.2
B-28, 1-2 ft	--	--	--	--	--	--	6.2	1.9	--	--	1.8	--	3.4
B-28, 3-4 ft	25	--	--	--	--	--	300	6.5	8.5	--	--	--	190
TP1	--	12	--	21	100	920	1,000	3.3	490	1.2	3.2	--	1,400
TP2	98	12	--	46	570	370	5,100	1.8	58	4.9	31	--	2,500
TP3	61	2.0	--	29	330	4,800	3,400	1.4	250	2.3	9.6	--	3,200
TP4	--	21	--	19	140	980	1,200	1.4	520	--	7.1	--	3,600
TP5	--	13	--	10	88	680	2,000	3.7-20	120	0.78	3.1	--	1,300
TP6	22	24	--	22	100	600	2,600	1.7-6.7	120	1.2	6.3	--	14,000
TP7	--	--	--	--	8.0-580	45-3,700	58	0.89	--	--	5.4	--	22-3,100
TP8	--	11	--	19	130	270	2,300	1.6	130	--	--	--	4,400
TP9	--	--	--	11	240	630	2,700	0.94	71	--	13	--	1,200
TP10	--	--	--	2.8	110	380	8.0	5.9	23	--	2.1	--	820

-- = Not detected.

Results are in parts per million (mg/kg dry weight).

Samples were collected and analyzed by International Technology Corporation, Edison, New Jersey.

Table 2-VII

TOTAL PETROLEUM HYDROCARBONS IN SOILS
HARRISON AVENUE LANDFILL
KEARNY, NEW JERSEY
MAY 1991

	Total Petroleum Hydrocarbons
B-22 1-2 feet	1,200
B-22 6-7 feet	200
B-23 1-2 feet	21,000
B-23 6-7 feet	5,700
B-24 1-2 feet	2,900
B-24 6-7 feet	120
B-25 1-2 feet	510
B-25 11-12 feet	3,000
B-26 1-2 feet	2,800
B-26 15-17 feet	8,500
B-27 1-2 feet	960
B-27 6-7 feet	940
B-28 1-2 feet	6,000
B-28 6-7 feet	43,000
TP1	1,900
TP2	15,000
TP3	820
TP4	1,900
TP5	390
TP6	2,300
TP7	580,000
TP8	5,100
TP9	23,000
TP10	7,000

...re in parts per million (ppm – mg/kg dry weight).

...were collected and analyzed by International Technology Corporation, Edison, ...y.

...collected contained elevated petroleum hydrocarbons, which is evidence of ...d oil on the site. This is typical for a site that was used for disposal of ...e parts.

Polychlorinated Biphenyls

...vestigations were undertaken in May 1991. Four borings were placed north, ...th, and west of December 1988 boring B-4 to delineate PCB contamination in

Table 2–IX

PCBs IN SOILS
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
MAY 1991

	PCB–1016	PCB–1221	PCB–1232	PCB–1242	PCB–1248	PCB–1254	PCB–1260	Total PCBs (ppm)
et	—	—	—	—	—	—	10,000	10
et	—	—	—	—	—	—	420	0.4
et	—	—	—	19,000	—	—	980	20.0
et	120	—	—	—	—	—	100	0.2
et	—	—	—	—	1,400	—	910	2.3
:et	—	—	—	—	36,000	—	10,000	46.0
:et	—	—	—	—	650	—	520	1.2
:et	—	—	—	—	3,000	—	640	3.6
:et	—	—	—	—	—	—	300	0.3
feet	—	—	—	—	—	—	240	0.2
eet	—	—	—	—	—	—	430	0.4
feet	1,500	—	—	—	—	—	400	1.9
eet	—	—	—	—	—	3,900	—	3.9
eet	1,800	—	—	—	—	—	6,500	8.3
eet	—	—	—	—	—	—	4,200	4.2
eet	—	—	—	—	—	—	—	0
	—	—	—	—	—	—	—	0
	—	—	—	—	—	—	—	0
	—	—	—	—	2,200	—	1,100	3.3
	—	—	—	—	1,600	—	1,100	2.7
	—	—	—	—	—	—	750	0.8
	—	—	—	—	1,000	—	1,900	2.9
	—	—	—	2,500	—	—	3,200	5.7
	—	—	—	—	1,500	—	390	1.9
	—	—	—	2,500	—	—	970	3.5
	—	—	—	—	—	—	—	0

etected.

e in parts per billion; totals are in parts per million.

ere collected and analyzed by International Technology Corporation, Edison, New Jersey.

Table 2-X

BASE/NEUTRAL EXTRACTABLE COMPOUNDS IN SOIL
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
MAY 1991

	bis(2-ethylhexyl) phthalate	Di-ethyl phthalate	Di-n-Octyl phthalate	Butylbenzyl phthalate	Dimethyl phthalate	Di-n-Butyl phthalate	Fluoranthene	Phenanthrene	Pyrene	Total PAH
B-21 1-2'	6,900	--	--	--	--	--	--	--	--	0
B-22 1-2'	14,000	--	--	--	--	--	--	--	--	0
B-23 1-2'	2,700	1,100	2,800	--	--	--	--	--	--	0
B-23 6-7'	50,000	--	--	--	--	--	--	--	--	0
B-24 1-2'	65,000	--	--	--	--	--	--	--	--	0
B-25 11-12'	3,100	--	--	--	--	--	940	--	1,000	1,940
B-26 1-2'	26,000	--	--	--	--	--	--	--	--	0
B-26 15-17'	22,000	--	--	--	--	--	--	--	--	0
B-28 1-2'	98,000	--	--	25,000	--	--	42,000	34,000	34,000	110,000
B-28 3-4'	290,000	--	--	111,000	73,000	--	--	--	--	0
TP1	1,000	--	--	--	--	--	--	--	--	0
TP2	36,000	--	--	34,000	16,000	15,000	--	--	--	0
TP4	12,000	--	--	--	--	--	--	--	--	0
TP6	4,900	--	--	--	--	--	--	--	--	0
TP7	14,000	--	--	--	--	--	--	--	--	0
TP8	9,100	--	--	--	--	--	--	--	--	0
TP9	290,000	--	--	--	--	--	--	--	--	0
TP10	190,000	--	--	120,000	73,000	--	--	--	--	0

Results are in parts per billion (ug/kg dry weight).

Samples were collected and analyzed by International Technology Corporation, Edison, New Jersey.

Table 2-XI

VOLATILE ORGANICS IN SOILS
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
MAY 1991

	Chloro-benzene	Ethyl-benzene	Methylene Chloride	Tetrachloro-ethylene	Toluene	1,1-Dichloro-ethane	1,2-Dichloro-ethylene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Trichloro-fluoromethane
	37	1000	49	4	1000	570	77	210	23	
B-22 1-2'	No volatiles detected.									
B-22 6-7'	No volatiles detected.									
B-23 1-2'	--	7	7	29	8	--	--	--	--	--
B-23 6-7'	--	--	25	--	--	--	--	--	--	--
B-24 1-2'	--	--	10	14	--	--	--	--	--	--
B-24 6-7'	100	--	--	26	--	--	--	--	--	--
B-25 1-2'	No volatiles detected.									
B-25 11-12'	No volatiles detected.									
B-27 1-2'	No volatiles detected.									
B-27 6-7'	No volatiles detected.									
B-28 1-2'	--	--	--	--	11	16	440	9	110	170
B-28 3-4'	--	420,000	8,700	--	1,700,000	8,600	10,000	--	1,100,000	--
TP4	No volatiles detected.									
TP5	--	--	7	--	--	--	--	--	--	--
TP6	No volatiles detected.									
TP8	170	--	--	--	--	--	--	--	--	--
TP9	170	--	--	--	--	--	--	--	--	--

Results are in parts per billion (ug/kg dry weight).

Samples were collected and analyzed by International Technology Corporation, Edison, New Jersey.

Table 2-XII

METALS IN GROUNDWATER
HARRISON AVENUE SITE
KEARNY, NEW JERSEY
JUNE 1991

	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Sodium	Thallium	Zinc
MW-21	--	0.011	--	--	0.090	0.17	120	0.46	2.0	0.002	0.12	--	0.014	420	--	0.60
MW-22	0.025	0.75	--	0.083	0.062	3.6	320	13	2.5	0.037	1.0	--	0.048	52	--	22
MW-23	--	0.028	--	0.014	0.056	0.73	210	2.9	1.4	0.004	0.22	--	0.019	40	--	6.0
MW-24	--	0.033	--	0.010	0.038	1.9	260	6.9	1.4	0.004	0.30	--	0.031	40	--	5.1
MW-25	--	0.11	0.006	0.065	0.072	2.2	320	7.3	1.6	0.018	1.3	--	0.022	140	--	15
MW-26	--	0.043	--	0.008	0.034	0.86	280	2.6	1.6	0.004	0.24	--	0.018	37	--	4.4
MW-27	--	0.024	--	0.020	0.031	1.3	140	5.6	1.0	0.005	0.23	--	0.041	88	--	3.5
MW-28	--	0.040	--	0.031	0.079	1.0	180	5.0	1.5	0.020	1.6	0.009	--	720	--	7.3
Field Blank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

-- = Not detected.

Results are in parts per million (mg/liter).

Samples were collected and analyzed by International Technology Corporation, Edison, New Jersey.

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 529456	PROJECT NAME: Harrison Ave. Landfill		
BORING NUMBER: B-21	COORDINATES:		DATE: 5/13/91
ELEVATION:	GWL: Depth ~6'	Date/Time 5/13 1256	DATE STARTED: 5/13/91
ENGINEER/GEOLOGIST: T. Cumello	Depth	Date/Time	DATE COMPLETED: 5/13/91
DRILLING METHODS: Auger Rotary			PAGE 1 OF 1

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
1–3	S-1	4-3 1-4	1.1	Fill brown m-f sand, some f-gravel little clay.				Soil is very soft in consistency. Pieces of cloth, plastic in soil
3–5				do "(above)"				HNu reading 1'-2' = .5ppm
5–7	S-2	2-1 1-1	1.1	Brown Clay; some silt				HNu reading 3'-5' = 0ppm
7–10								HNu reading = 0ppm, Water table at ~6'
10–12		2-2 5-8	1.8	Gray f-m sand, little silt Gray to reddish brown clay, some silt little f-m sand	CL			
15–17		2-4 6-9	1.6	Gray to reddish brown m-c sand little silt				
				completion Depth = 17'				

NOTES:

Drilling Contractor: Warren George Inc., Jersey City

Drilling Equipment:

Driller: Mike McErlean

10' of sch 40, 4" diameter PVC (0.020") scr 15'-5'
8' of sch 40, 4" diameter PVC sold casing set 5'-above
5-100 lbs bags of Morie 1-2 gravel set 15'-3'
25 lbs of bentonite pellets set 3'-2'

[...]NATIONAL
[...]NOLOGY
[...]ORATION

VISUAL CLASSIFICATION OF SOILS

[...] 529456
[...] B-22
[...]OGIST: T. CUMELLO
[...]OD: AUGER ROTARY

PROJECT NAME: HARTZ MOUNTAIN HARRISON AVE LANDFILL	
COORDINATES:	DATE: 05/14/91
GWL: Depth 7' Date/Time 5/14	DATE STARTED: 05/14/91
Depth Date/Time	DATE COMPLETED: 05/14/91
	PAGE 1 OF 1

[...]	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
						HNu reading = 0 ppm
3-3 1-1	0.8	Fill, BROWN, f.m. SAND, some silt and c-f gravel (pieces of glass, brick, plastic				HNu reading = 1 ppm
6-6 3-3	0.4	do "(above)"	FILL			
1-2 1-1	0.2	FILL, brown to black f.m. SAND, some clay (pieces of wood, glass, cloth, plastic)				HNu reading = 2 ppm Water table at ~7'
9-4 4-4	NR	No recovery				WOOD CLOGGED UP IN NOSE OF SPOON
1-2 1-1	NR	No recovery				
			CC			
1-1 4-5	0.5	Dark grey CLAY, some f. SAND and SILT				
		COMPLETION DEPTH = 17'				

[...] WARREN GEORGE INC. JERSEY CITY, NJ
[...] CME-55 RIG
[...] McFELEAN

2438-3-86

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

ROJECT NUMBER: 579456	PROJECT NAME: HARTZ MOUNTAIN, HARRISON AVE LANDFI		
ORING NUMBER: B-23	COORDINATES:		DATE: 05/14/91
EVATION:	GWL: Depth 7'	Date/Time 5/14 1306	DATE STARTED: 05/14/9
NGINEER/GEOLOGIST: T. CUMELIO	Depth	Date/Time	DATE COMPLETED: 05/14/9
RILLING METHODS: AUGER ROTARY			PAGE 1 OF 1

(ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5 ft)	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
1								
2	S-1	2-2 3-4	0.7	Fill, brown, m-f SAND, some SILT AND GRAVEL (pieces of glass, brick)				HNu reading = 1 ppm
3–5		40-2 2-3	NR	No recovery				HNu reading = 0 ppm
6–7	S-2	6 5 3-7	0.6	Fill, black to brown CLAY, some SILT, f-m gravel (pieces of glass, aluminum, rags, plastic)				HNu reading = 1 ppm Water table @ 7'
8–9		3-4 2-2	0.2	Black, fill CLAY, some SILT				HNu reading = 1 ppm
10–12		22-35 100/5"	1.0	Fill, black to brown wood (from telephone pole?)				
13–14								
15–17		12-14 6-8	1.2	Dark gray f. SAND, some SILT				
				COMPLETION DEPTH = 17'				
18								
19								
20								

NOTES:

Drilling Contractor: WARREN GEORGE INC. JERSEY CITY, NJ

Drilling Equipment: CME-55

Driller: MIKE McERLEAN

...ATIONAL
...OLOGY
...RATION

VISUAL CLASSIFICATION OF SOILS

529456	PROJECT NAME: Hartz Mountain, Harrison Ave Landfill, Kearny		
B-24	COORDINATES:		DATE: 05/14/91
	GWL: Depth ~ 7'	Date/Time 5/14 1537	DATE STARTED: 05/14/91
...IST: T. Curiello	Depth	Date/Time	DATE COMPLETED: 05/14/91
Auger rotary			PAGE 1 OF 1

...	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
3-3 / 3-3	0.8	Fill, brown, m-f SAND, some SILT, f-m gravel (Fill, pieces of glass, rubber, rags)				HNu reading = 0 ppm. Low reading due to refuse in soil matrix and the use of 2" diameter split-spoons.
3-4 / 6-8	0.4	do "(above)"				HNu reading 3'-5' = 0 ppm
1-3 / 1-3	0.7	Fill, brown, CLAY, some SILT (pieces of wood, plastic, clothing, glass)				HNu reading 5'-7' = 0 ppm.
... / 7-7	0.4	do "(above)"				
2-2 / 2-2	NR	No recovery.				
5-2 / 8-13	2'	Gray to reddish brown, f-m SAND, little silt				
		COMPLETION DEPTH = 17'				

...: WARREN GEORGE, JERSEY CITY, NJ

...: CME 55 DRILLING RIG

...: McELEAN

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 529456	PROJECT NAME: HARTZ MOUNTAIN INC HARRISON AVE LANDF		
BORING NUMBER: B-25	COORDINATES:		DATE: 5/15/91
ELEVATION:	GWL: Depth ~12'	Date/Time 5/15 1141	DATE STARTED: 5/15
ENGINEER/GEOLOGIST: T. COMELLO	Depth	Date/Time	DATE COMPLETED: 05
DRILLING METHODS: AUGER ROTARY			PAGE 1 OF

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5 ft)	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
1				FILL				
2	S-1	4-4 4-3	1.3	Brown to black f-m SAND, some SILT and f-gravel				HNu reading = 1 ppm
3								
4		6-3 4-5	NR	No recovery				
5								
6		12-11 15-17	0.4'	Fill, brown f-m SAND and refuse (pieces of plastic, paper, glass)				HNu reading = 2 ppm
7								
8		16-15 7-5	0.5	Fill, pieces of brick, plastic, wood, and some brown to black				HNu reading = 2 ppm
9								
10		16-5 5-5	1.7'	do "(above)"				
11	S-2							HNu reading = 3 ppm Water table @ ≈ 12'
12								
13		12-4 8-4	1.1	Fill, black f-sand, and CLAY, pieces of plastic, brick, wood, glass.				
14								
15								
16		25-18 17-14	1.2					
17								
18								
19								
20								
				COMPLETION DEPTH = 20'				

NOTES:

Drilling Contractor WARREN GEORGE, JERSEY CITY, NJ

Drilling Equipment CME-55 DRILL RIG

Driller: MIKE McFRLEAN

ATIONAL
OLOGY
RATION

VISUAL CLASSIFICATION OF SOILS

579456	PROJECT NAME: HARTZ MOUNTAIN, HARRISON AVE LANDFILL, KEARNEY		
B-27	COORDINATES:	DATE:	05/16/91
	GWL: Depth 7' Date/Time 5/16 1014	DATE STARTED:	05/16/91
...ST: T. CUMELLO	Depth Date/Time	DATE COMPLETED:	05/16/91
AUGER ROTARY		PAGE 1 OF 1	

Blows (per 6 in.)	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
2-6 3-7	0.7	Fill, brown f-m SAND, some SILT, and refuse (plastic, wood glass)				USED 3" SPLIT SPOON FOR 1'-3' INTERVAL
5-1 4-4	0.8	do "(above)"				
5-13 13-13	1.9	Fill (black f-m sand, some CLAY and refuse (plastic, wood, paper, glass)				WATER TABLE @ 7'
9-4 3-7	0.8		FILL			USED 3" SPLIT SPOON FOR 5'-7' INTERVAL
-						
12-7 4-4	NR	No recovery				
1-1 6-15	1.6	Grey f.m. SAND, some SILT Grey SILT, some CLAY, little	SC			
		COMPLETION DEPTH = 17'				

...WARREN GEORGE INC., JERSEY, NJ
... CME-55 RIG
... MCERLEAN

10' - 4" diameter 0.0020" slotted pvc screen test 15'-5'
7' - 4" diameter PVC solid casing set 5'-2' above surface
4 - 100 lb bags of Morie 1-2 SAND set from 15'-3'
- 25 lb of bentonite pellets set from 3'-2'
- 96 lb bags of cement used to grout

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

JECT NUMBER: 524456	PROJECT NAME: HARTZ MOUNTAIN IND HARRISON AVE LANDFILL, KEARNY		
ING NUMBER: B-26	COORDINATES:		DATE: 05/15/91
VATION:	GWL: Depth 7'	Date/Time 5/15 1404	DATE STARTED: 05/15/91
INEER/GEOLOGIST: T. CUMELLO	Depth	Date/Time	DATE COMPLETED: 05/15/91
LING METHODS: AUGER ROTARY			PAGE 1 OF 1

SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5 ft)	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
S-1	3-3 4-3	0.9	Fill, brown f-m sand, little silt Refuse (pieces of glass, wood, plastic)				HNu READING = 0 ppm
	5-2 21-55	0.4	do "(above)"				HNu READING = 0 ppm
	4-2 11-12	NR	No recovery				
	19-5 5-9	NR	No recovery				GROUNDWATER @ ~7' TOOK SPLIT SPOON SAMPLES 3 TIMES. IN 5-7' INTERVAL STILL NO RECOVERY
	4-25 52-70	NR	No recovery				
S-2	8-2 2-2	0.7	Brown, f-m SAND, some CLAY	SC			
			COMPLETION DEPTH = 17'				

OTES:

illing Contractor WARREN GEORGE INC JERSEY CITY, NJ

illing Equipment CME-55 RIG

iller: MIKE MCERLEAN

...ATIONAL
...LOGY
...ATION

VISUAL CLASSIFICATION OF SOILS

...329456	PROJECT NAME: HARTZ MOUNTAIN IND. HARRISON AVE LANDFILL, KEARNY	
...B-28	COORDINATES:	DATE: 05/18/91
	GWL: Depth 4' Date/Time 5/16 1201	DATE STARTED: 05/16/91
	Depth Date/Time	DATE COMPLETED: 05/16/91
...: T. CUMELLO		PAGE 1 OF 1
...: AUGER ROTARY		

[illegible]	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
[illegible]	1.4	Fill, brown. f.m., SAND some f. gravel little silt (pieces of concrete, cinder)				HNU READING = 170 ppm.
[illegible]	1.1	Fill: black CLAY, some silt, cinders black thick product				HNU READING = 200 ppm WATER TABLE @ 4'
[illegible]	0.4	do "(above)"				
2-2 2-2	0.7	Black f-m SAND, some CLAY				
		COMPLETION DEPTH = 14'				

...: WARREN GEORGE INC, JERSEY CITY NJ

...: CME-55 RIG

...: McERLEAN

...TECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	D-4

Hartz Mountain Industries, Inc.		WELL PERMIT NO:	26-50239
Harrison Avenue Landfill		TOP OF CASING ELEV.:	15.12 ft
Harrison Avenue and Bergen Avenue, Kearny, NJ		GROUND TO T.O.C:	
...DEP CASE NO:		GROUND ELEVATION:	12.9 ft
... LOCATION:	see site map	DATE COMPLETED:	3-31-98
...TRACTOR:	Summit Drilling Co.	TOTAL DEPTH:	33 ft
		SCREENED INTERVAL:	23-33 ft
		DEVELOPMENT USING:	Centrifugal pump DURATION: 1 hr.
		YIELD (GPM):	Approx. 6 gpm
		DRILLER:	Steve Yotcoski CERT. # J1622
		INSPECTOR:	M. Alcala CERT. #

GROUND WATER LEVEL(S): MEAS. FROM	DATE	TIME
TOC	4-16-98	

DRILLING METHOD AND BIT USED: Mobile B-80 air/water rotary; 12" bit from 0-21 ft; 8" bit from 22-33 ft; 2" dia. 2' long split-spoon samplers

DEPTH (bgs)	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS	WELL CONSTRUCTION
					2.5 ft standpipe
1.0					
2.0					4" ID Sch 40 blank PVC riser
3.0			Fill material: glass, brick, paper, plastic, ceramic, rubber, automobile parts (e.g. air filters, fenders), little gravel, little silt		
4.0		Drill through with air rotary bit			
5.0					10" OD steel outer casing grouted in 12" dia. borehole
6.0					
7.0					
8.0					
9.0					
10.0				Water table at 9-10 ft	
11.0					
12.0					
13.0	10, 8, 7, 8	2"	Same as above (fill) with some organic silt, little sand		
14.0					
15.0	4, 8, 5, 4	3"	Same as above (fill) with wood, some gravel, some silt, little sand		
16.0					
17.0	3, 3, 5, 14	10"	Same as above (fill) with some organic silt, little sand / 2" peat layer noted at approx. 16.5 ft; this layer is underlain by gray medium to fine sand		
18.0					
19.0	10, 14, 14, 20	14"	Gray medium to fine sand and grayish blue-green silty lenses		Annular spaces grouted w/ portland
20.0					

...ECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	B-39	PAGE # 1 of 1
Hartz Mountain Industries, Inc.		WELL PERMIT NO:	NA	
Harrison Avenue Landfill		TOP OF CASING ELEV.:		
Harrison Avenue and Bergen Avenue, Kearny, NJ		GRADE TO T.O.C:		
...LOCATION: see site map		DATE COMPLETED:	4-28-98	
...ACTOR: Envirotech Consultants		TOTAL DEPTH:	19 ft	
...OUND WATER LEVEL(S):	DRILLING METHOD AND BIT USED:	SCREENED INTERVAL:	NA	
...AS. FROM / DATE / TIME	Simco Earthprobe 200 pickup truck mounted	DEVELOPMENT USING:	NA	DURATION:
	hydraulic hammer with 2" ID 4' long Geoprobe	YIELD (GPM):	NA	
	MacroCore Soil Sampler	DRILLER:	R. Dydo	CERT. #
		INSPECTOR:	M. Alcala	CERT. #

...PTH (...)	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS	WELL CONSTRUCTION
1.0			Brown loamy silt with wood, glass, plastic, etc.		Boring sealed with bentonite & cuttings
2.0		15"			
3.0					
4.0					
5.0					
6.0		5"	Black fill: wood, glass, paper, etc.	Wet	
7.0					
8.0					
9.0		4"	Same as above		
10.0					
11.0					
12.0		0.0	(no recovery due to piece of wood being pushed down by sampler)		
13.0					
14.0			Gray to black silt, little sand; with fragments of glass, metal, wood, cinders, leather, paper, etc. in matrix of silt/ash		
15.0		23.0			
16.0					
17.0					
18.0		26"	4" of black organic silt (peat) 6" of brown silt and fine sand	Dry; artesian condition upon penetration of this layer	
19.0			Gray coarse to medium sand (loose), some silt	Wet	

[illegible]TECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	B-38	PAGE # 1 of 1
Hartz Mountain Industries, Inc.		WELL PERMIT NO:	NA	
Harrison Avenue Landfill		TOP OF CASING ELEV.:		
Harrison Avenue and Bergen Avenue, Kearny, NJ		GRADE TO T.O.C:		
[illegible] LOCATION: see site map		DATE COMPLETED:	4-28-98	
[illegible]TRACTOR: Envirotech Consultants		TOTAL DEPTH:	13 ft	
GROUND WATER LEVEL(S):	DRILLING METHOD AND BIT USED:	SCREENED INTERVAL:	NA	
MEAS. FROM / DATE / TIME	Simco Earthprobe 200 pickup truck mounted hydraulic hammer with 2" ID 4' long Geoprobe MacroCore Soil Sampler	DEVELOPMENT USING:	NA	DURATION:
		YIELD (GPM):	NA	
		DRILLER:	R. Dydo	CERT. #
		INSPECTOR:	M. Alcala	CERT. #

DEPTH (BGS)	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS	WELL CONSTRUCTION
1.0			Dark brown loamy silt, some sand, some medium to fine gravel		Boring sealed with bentonite & cuttings
2.0		24"			
3.0			Light brown fill: c-f sand and ash with cinders, glass, wood, plastic		
4.0			same as above with gray colors	GW level initially at 4' b.g.	
5.0					
6.0		11"	Gray to light gray fill: small fragments of ceramic, glass, wood, with paper, wood, in silt/ash matrix		
7.0					
8.0			5" of dark brown, soft, organic silt (peat); underlain by 5" of light brown silt with few roots (soft)	Dry	
9.0		24"		Note: artesian condition upon penetrating this layer; GW level increased from 4' to 2' b.g.	
10.0			Light gray coarse to medium sand, little fine sand, with 1" thick lenses of brown silt/clay		
11.0					
12.0		34"	Light gray coarse to medium sand, little fine sand; silt/clay lenses decreasing with depth	Wet	
13.0					

...TECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	B-37	PAGE # 1 of 1
Hartz Mountain Industries, Inc.		WELL PERMIT NO:	NA	
Harrison Avenue Landfill		TOP OF CASING ELEV.:		
Harrison Avenue and Bergen Avenue, Kearny, NJ		GRADE TO T.O.C:		
...LOCATION: see site map		DATE COMPLETED:	4-23-98	
...TRACTOR: Envirotech Consultants		TOTAL DEPTH:	16 ft	
...OUND WATER LEVEL(S):	DRILLING METHOD AND BIT USED:	SCREENED INTERVAL:	NA	
MEAS. FROM / DATE / TIME	Simco Earthprobe 200 pickup truck mounted hydraulic hammer with 2" ID 4' long Geoprobe MacroCore Soil Sampler	DEVELOPMENT USING:	NA	DURATION:
		YIELD (GPM):	NA	
		DRILLER:	R. Dydo	CERT. #
		INSPECTOR:	M. Alcala	CERT. #

DEPTH (bgs)	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS	WELL CONSTRUCTION
1.0		48"	Cobbles, asphalt, wood, concrete (compact, hard)		Boring sealed with bentonite & cuttings
2.0					
3.0					
4.0			same as above, with glass fragments		
5.0		38"	Black (burnt) fill: cinders/ash, wood, brick, glass, paper, etc.		
6.0					
7.0					
8.0		30"			
9.0					
10.0					
11.0		12"			
12.0			Same as above		
13.0					
14.0		14"			
15.0					
16.0			6" thick layer of brown organic silt and fine sand; upper 2" with decayed roots/leaves (peat)	Note: artesian condition upon penetrating this layer	

...TECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	B-36	PAGE # 1 of 1

Hartz Mountain Industries, Inc.		WELL PERMIT NO:	NA
Harrison Avenue Landfill		TOP OF CASING ELEV.:	
Harrison Avenue and Bergen Avenue, Kearny, NJ		GRADE TO T.O.C:	
...LOCATION:	see site map	DATE COMPLETED:	4-23-98
...ACTOR:	Envirotech Consultants	TOTAL DEPTH:	17 ft
...GROUND WATER LEVEL(S):	DRILLING METHOD AND BIT USED:	SCREENED INTERVAL:	NA
...MEAS. FROM / DATE / TIME	Simco Earthprobe 200 pickup truck mounted	DEVELOPMENT USING:	NA DURATION:
	hydraulic hammer with 2" ID 4' long Geoprobe	YIELD (GPM):	NA
	MacroCore Soil Sampler	DRILLER:	R. Dydo CERT. #
		INSPECTOR:	M. Alcala CERT. #

DEPTH (feet)	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS	WELL CONSTRUCTION
1.0			Brown to gray-brown, mottled silt, little coarse to fine sand; loamy upper portion with fine roots		Boring sealed with bentonite & cuttings
2.0		20"			
3.0					
4.0			same as above with glass fragments		
5.0					
6.0		35"	Gray to black fill: glass, cinders/ash, wood, paper, in silty/clayey matrix (20 to 40%)		
7.0					
8.0					
9.0		30"	Same as above with abundant wood; black colors		
10.0				wet @ 9-10 ft	
11.0					
12.0		25"	Same as above, with more matrix (40 to 50%)		
13.0					
14.0					
15.0					
16.0		24"	Brown to grayish brown organic silt, some clay; Upper 8" portion with decayed roots/leaves (peat); Lower part with more clay		
17.0			Olive-gray medium sand (loose)		

[illegible]TECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	B-35	PAGE # 1 of 1
Hartz Mountain Industries, Inc.		WELL PERMIT NO:	NA	
Harrison Avenue Landfill		TOP OF CASING ELEV.:		
Harrison Avenue and Bergen Avenue, Kearny, NJ		GRADE TO T.O.C:		
[illegible] LOCATION: see site map		DATE COMPLETED:	4-23-98	
[illegible]TRACTOR: Envirotech Consultants		TOTAL DEPTH:	23 ft	
[illegible] WATER LEVEL(S):	DRILLING METHOD AND BIT USED:	SCREENED INTERVAL:	NA	
MEAS. FROM / DATE / TIME	Simco Earthprobe 200 pickup truck mounted hydraulic hammer with 2" ID 4' long Geoprobe MacroCore Soil Sampler	DEVELOPMENT USING:	NA	DURATION:
		YIELD (GPM):	NA	
		DRILLER:	R. Dydo	CERT. #
		INSPECTOR:	M. Alcala	CERT. #

DEPTH [illegible]	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS	WELL CONSTRUCTION
1.0			Fill: plastic, wood, glass, cinders, etc. in red-brown to gray silty matrix (approx. 10%)		Boring sealed with bentonite & cuttings
2.0		35"			
3.0					
4.0					
5.0					
6.0		10"	Same as above, with abundant paper (e.g., newspaper)		
7.0					
8.0					
9.0		4"	Same as above with abundant wood, plastic, paper		
10.0					
11.0					
12.0		20"	Same as above, with black colors (burnt material)		
13.0					
14.0				Sheen, slight oil odor (assoc. with refuse)	
15.0					
16.0					
17.0		22"			
18.0			Light brown fine sand, little silt with 1-4" thick grayish blue-green silt/clay layers (with fine roots)		
19.0					
20.0			Gray to red-brown medium to fine sand with fewer red-brown silt/clay lenses		
21.0		48"	Reddish-brown medium to fine sand, trace lenses of red-brown silt/very fine sand		
22.0					
23.0					

...TECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	B-34	PAGE # 1 of 1
Hartz Mountain Industries, Inc.		WELL PERMIT NO:	NA	
Harrison Avenue Landfill		TOP OF CASING ELEV.:		
Harrison Avenue and Bergen Avenue, Kearny, NJ		GRADE TO T.O.C:		
...LOCATION:	see site map	DATE COMPLETED:	4-23-98	
...ACTOR:	Envirotech Consultants	TOTAL DEPTH:	14 ft	
...GROUND WATER LEVEL(S):	DRILLING METHOD AND BIT USED:	SCREENED INTERVAL:	NA	
...MEAS. FROM / DATE / TIME	Simco Earthprobe 200 pickup truck mounted	DEVELOPMENT USING:	NA	DURATION:
	hydraulic hammer with 2" ID 4' long Geoprobe	YIELD (GPM):	NA	
	MacroCore Soil Sampler	DRILLER:	R. Dydo	CERT. #
		INSPECTOR:	M. Alcala	CERT. #

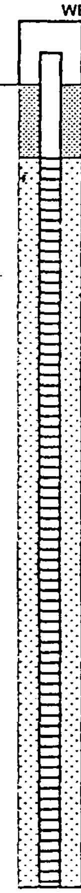
DEPTH	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS	WELL CONSTRUCTION
1.0			Brown loamy soil with gravel, glass, wood, paper		Boring sealed with bentonite & cuttings
2.0		40"			
3.0					
4.0			Gray to black fill: cinders/ash, coal, burnt paper, glass, wood, in brown to gray silty matrix (approx.10%)		
5.0					
6.0		14"			
7.0				*Oil odor & sheen associated* with wood fragments	
8.0					
9.0		14"			
10.0			Light gray to brown medium to fine sand & silt with grayish blue-green to brown silt/clay lenses (1"-2" thick) (Silt/clay lenses are laminated)		
11.0				Note: artesian condition upon penetrating this confining layer	
12.0		24"			
13.0			Brown to reddish-brown coarse to medium sand, little fine sand, little silt		
14.0					

...ECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	MW-33	PAGE # 1 of 1

Hartz Mountain Industries, Inc.		WELL PERMIT NO:	26-50243
Harrison Avenue Landfill		TOP OF CASING ELEV.:	9.61 ft
Harrison Avenue and Bergen Avenue, Kearny, NJ		GROOUND TO T.O.C:	
...DEP CASE NO:		GROUND ELEVATION:	8.60 ft
...LOCATION:	see site map	DATE COMPLETED:	3-27-98
...ACTOR:	Summit Drilling Co.	TOTAL DEPTH:	11 ft
...OUND WATER LEVEL(S):	DRILLING METHOD AND BIT USED:	SCREENED INTERVAL:	1-11 ft

MEAS. FROM	DATE	TIME	DRILLING METHOD AND BIT USED				
			Mobile B-80 air/water rotary;	DEVELOPMENT USING:	Centrifugal pump	DURATION: 1 hr.
Grade	3-27-98	10:00	8" dia. bit from 0-12 ft;	YIELD (GPM):	Approx. 6-7 gpm	
TOC	4-16-98		2" dia. 2' long split-spoon samplers	DRILLER:	Steve Yotcoski	CERT. # J1622
				INSPECTOR:	M. Alcala	CERT. #

DEPTH (feet)	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS	WELL CONSTRUCTION
			Brown silt, with roots, some fill (wood, plastic)		2.5 ft standpipe
1.0					Annular space grouted with cement/bentonite
					4" ID Sch 40
2.0					PVC riser 0-1 ft b.g.
	3				
3.0	2	2"	Brown silt, some medium to fine gravel,	Wet at 3'	
	1		some fragments of glass, coal, brick, etc		
4.0	2				
	2				
5.0	2	2"	Brown silt/clay with leaves, some fill (plastic)		
	2				
6.0	2				4" ID Sch40 PVC screen
	1				0.02 slot
7.0	1	2"	Black silt/clay with leaves and fill, some medium to fine gravel		
	1				
8.0	3				
	10				
9.0	7	4"	Black fill: newspaper, leather, etc in silty matrix, some gravel		#1 Well sand (filter pack)
	3				
10.0	3				
	15		2" brown, soft peat layer with roots/leaves @ around 10 ft		
11.0	15	8"	underlain by black fill: glass, wood, etc. in silty matrix		Bottom of screen/sand
	11				at 11 ft b.g.
12.0	8				



...ECH CONSULTANTS, INC.	Boring/Well Log	Boring/Well ID.	MW-32	PAGE # 1 of 1

Hartz Mountain Industries, Inc.	
Harrison Avenue Landfill	
Harrison Avenue and Bergen Avenue, Kearny, NJ	
...P CASE NO:	
...LOCATION:	see site map
...ACTOR:	Summit Drilling Co.

WELL PERMIT NO:	26-50237
TOP OF CASING ELEV.:	21.45 ft
GROUND TO T.O.C:	
GROUND ELEVATION:	19.50 ft
DATE COMPLETED:	3-27-98
TOTAL DEPTH:	20 ft
SCREENED INTERVAL:	8-20 ft
DEVELOPMENT USING:	Centrifugal pump DURATION: 1 hr.
YIELD (GPM):	Approx. 1-2 gpm
DRILLER:	Steve Yotcoski CERT. # J1622
INSPECTOR:	M. Alcala CERT. #

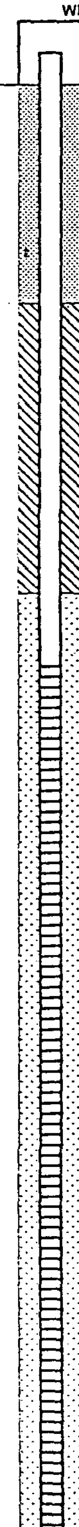
...UND WATER LEVEL(S):

...AS. FROM	DATE	TIME
Grade	3-30-98	8:00
TOC	4-16-98	

DRILLING METHOD AND BIT USED:
Mobile B-80 air/water rotary;
8" dia. bit from 0-20 ft;

... (ft...)	BLOWS per 6"	CORE REC (inches)	SOIL / ROCK DESCRIPTION Trace=0-10% Little=10-20% Some=20-35% And=35-50%	REMARKS
1.0				
2.0				
3.0				
4.0				
5.0			0 - 20 ft:	
6.0			Fill: plastic, glass, insulation material, paper, wood, *household refuse, demolition debris, ash, etc.* in a gray to black silty matrix	
7.0				
8.0				
9.0				
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				
16.0				
17.0				
18.0				
19.0				
20.0				

WELL CONSTRUCTION



2.5 ft standpipe

Annular space grouted with Portland cement

Bentonite seal 3-7 ft

4" ID Sch 40 blank PVC riser

Top of sand @ 7 ft

Top of screen @ 8 ft

4"ID Sch 40 PVC screen (0.02 slot)

#1 well sand (filter pack)

8" dia. borehole

Bottom of screen/sand at 20 ft

NEW JERSEY TURNPIKE

1985 - 90

FINAL
Environmental Impact Statement

Interchange 11 to U.S. Route 46

New Jersey Turnpike Authority

September 1987

Table 22 (Continued)

Milepost No.	Facility Name	Owner	Status of Operation	Wastes Accepted	Comments
107.3	V. Ottilio & Sons	Newark Redevelopment & Housing Authority	Terminated	Municipal waste	Hazardous wastes may be present DEP RI/FS underway.
108.1	HSLA 1-D (Kearny Municipal Sanitary Landfill)	HMDC/HSLA	Not operating, records cover 1971 to 1982	Municipal waste, dry sewage sludge, bulky waste, vegetative waste, animal food processing wastes, plus dry industrial waste, accepted oil spill cleanup and ind. waste	161 acres including buffer areas, 3,620,000 [illegible] yards total of waste de[illegible] landfill in 1982
108.3	HSLA II-C Landfill[c]	HSLA	Terminated	Municipal Waste	
108.3	HSLA 1-A Landfill[f]	HMDC	Terminated	Municipal Waste	
108.6	Interchange 15W Landfill[d] Disruption	NJ Turnpike Authority (Section near 15W)	Landfill disruption for road construction, closed	1979 test pit shows "household debris", municipal solid waste	This DEP landfill disruption file was created in response to Interchange 15W construction.
110.0	HMDC Balefill	HMDC	Operating	Municipal Waste	
110	HSLA 1-C Landfill[f]	HMDC	Terminated	Municipal Waste	
111	Kingsland Park Landfill	HMDC	Operating	Municipal Waste	
111.2	Avon Landfill	Avon Landfill Corporation	Terminated	Municipal waste, bulky waste, vegetative waste, animal food processing waste, dry industrial wastes.	
111.3	Lyndhurst Landfill	Multiple	Terminated	Domestic, industrial, and demolition wastes	
111.5-112	Rutherford Landfill	Borough of Rutherford	Terminated	Domestic, industrial, and demolition wastes.	
112.8	Unnamed Landfill A[e]	Unknown	Terminated	Unknown	
114.8	Unnamed Landfill B[e]	Unknown	Terminated	Unknown	

[a]Identified as part of T. Fiore Landfill (west) in the Draft EIS.
[b]Identified as DL[illegible] Landfill in the DEIS.

Table 36

LANDFILLS TO BE DISRUPTED

Name	Total Landfill Acres	Acres to be Disrupted	Nature of Disruption
& J Landfill (Newark)	11.4	0.77	Excavation/ Embankment
Devino Landfill (Newark)	63.5	0.05	Piers on Steel Piles
T. Fiore Landfill (Newark)	12.0	0.32	Embankment
Delancy Street Landfill (Newark)[a]	17.8	3.2	Excavation/ Embankment
Milepost 106 Landfill (Newark)[b]	54.8	14.0	Embankment
Avenue P Landfill (Newark)	40.0	27.0	Embankment/ Piers
Interchange 15E Landfill (Newark)	65.0	20.6	Excavation/ Embankment
MSLA II C Landfill (Kearny)[c]	22.0	0.22	Excavation for Pier Foundations
Interchange 15W Disruption Landfill (Kearny)[d]	15.6	5.2	Excavation
Rutherford Landfill, East of Turnpike (Rutherford)	105.0	1.1	Embankment
Total	407.1	72.46	

[a] Identified as part of T. Fiore Landfill (west) in the Draft EIS.

[b] Identified as D and J Landfill in the Draft EIS.

[c] Identified as the Old MSLA Landfill in the Draft EIS.

[d] Identified as the Route 280 Disrupted Landfill in the Draft EIS.

Note: This table has been revised from the table included in the Draft EIS to reflect updated information received and changes in design plans that have occurred. The Devino (East side of Turnpike), Ottilio, Lyndhurst, and Rutherford landfill (disruption for the Route 17 connection and wetlands) originally included in the Draft EIS table are no longer proposed to be disrupted. The Interchange 15E Landfill was discovered subsequent to release of the Draft EIS.

Source: Louis Berger & Associates, Inc.

19

August 12,

Councilman Ernest Spinello
Town Hall
402 Kearny Ave.
Kearny, N. J. 07032

Dear Councilman Spinello:

An inspection was made by the Health and Fire Departmen of the area north of Sha-Kel Auto Wreckers located at Berger and Harrison Ave. (Block 286, Lot 4).

The area is owned by the Town of Kearny and is being us by indiscriminate dumpers. The inspection disclosed tires, old truck bodies, trash and 50 gallon drums of flammable che being deposited on Kearny land.

THE FIELD INSPECTION REPORT SAYS DRUM CONTENTS ARE UNKNOWN

The inspectors of both departments will continue to obs the area in order to hopefully apprehend indiscriminate dump

We are also respectfully recommending that the Town of install a gate, chain or other suitable barrier across Berge Ave. at the northern property line of Phelps Tire Service in order to prevent entry of indiscriminate dumpers to the area

Enclosed is a copy of a town ordinance which possibly concerns the request we are making.

If you have any question, please contact Tom Dunwoody o the Kearny Fire Inspection Bureau or this writer.

Thanking you in advance, I remain

Yours truly,

Ed Grosvenor

Edward Grosvenor
Assistant Health O

EG:er
enc.
cc: Mayor and Town Council
J. J. Kurszwicz
Tom Dunwoody, Fire Insection
Bureau

ON A JOINT INSPECTION BY THE HEALTH DEPT. AND FIRE DEPT OF THE AREA NORTH OF SHA-KEL AUTO WRECKER LOCATED AT BERGEN AND HARRISON AVE IT WAS FOUND THAT IT WOULD BE BENEFICIAL TO THE TOWN OF KEARNY TO INSTALL A GATE OR CHAIN ACROSS BERGEN AVE AT THE PROPERTY LINE OF PHELI TIRE SERVICE TO IMPEDE ACCESS TO THIS AREA BY ILLEGAL DUMPERS

THIS AREA IS BEING USED TO DUMP TIRES, OLD TRUCK BODIES, TRASH, AND 50 GALLON DRUMS OF UNKNOWN CHEMICAL CONTENT SOME OF WHICH MAY BE FLAMMABLE OR DANGEROUS TO THE HEALTH.

WE WOULD LIKE THE MAYOR AND COUNCIL TO SERIOUSLY CONSIDER OUR RECOMMENDATION.

THE TOWN ORDINANCE WAS PASSED AND ADOPTED OCTOBER 13, 1971 REQUIRING FENCING ON CERTAIN LANDS IN THE TOWN OF KEARNY

Block 286
Lot 4
Town Kearny

Hackensack Meadowlands Development Commission
1099 WALL STREET WEST • LYNDHURST, NEW JERSEY 07071 • (201) 935-3250

PATRICIA Q. SHEEHAN
Chairman

WILLIAM D. McDOWELL
Executive Director

October 31, 1974

Verzaleno Realty Company
185 Corynan Avenue
Nutley, New Jersey

Attention: M. Verzaleno

RE: SHA-KEL AUTO WRECKERS, BLOCK 286, LOT 5, KEARNY, NEW JERSEY
FILE V-KE-13

Dear Sir:

On a routine inspection of your premises on Bergen Avenue, in the Town of Kearny, members of this Office observed garbage, debris, wood, truck bodies, tires and other items randomly strewn about the rear of the Sha-Kel Auto Wreckers causing a hazard to life and limb.

A check of our files indicates that this Office has never given permits or any approvals for the storage of this material on this land. This is a violation of the HMDC Zoning Regulations. Further, HMDC Regulations require that certain materials not be disposed of on lands except in designated HMDC Solid Waste Disposal Sites. This is a violation of HMDC Solid Waste Regulations.

Therefore, you are hereby ordered to cease and desist from any further placement of these materials. You are hereby ordered to remove all existing materials from the area on or before November 15, 1974. Your failure to comply with these directives shall cause this Office to refer your file to the State Attorney General for possible legal action, and the collection of fines and penalties.

We anticipate your immediate attention to this matter.

Sincerely,

OFFICE OF THE CHIEF ENGINEER

GEORGE D. CASCINO, P.E., P.P.
CHIEF ENGINEER

JB/jc
cc: Chief Sylvester, Kearny Fire Dept.
W. Nicol, Kearny Health Dept.
Town Clerk
M. First, Esq. D.A.G.
Certified Mail #293964

Former Walker/Woburn Chemical Site

amz geology
consulting geologists
43 Emery Avenue, Flemington, New Jersey 08822 (908) 788-0505

April 20, 2000

Mr. Yacoub Yacoub
New Jersey Department of Environmental Protection
Metropolitan Region
1 Babcock Place
West Orange, NJ 07052-5504

Re: File Reviews

Dear Mr. Yacoub:

I would like to review any files the Metropolitan Regional enforcement Office may have pertaining to the following property:

1200 Harrison Ave.
Kearny, Hudson County, NJ
Block 275 Lot 1
Current Owner: 4Bs Investments, Vineland, NJ
Former Owners: Walker Chemical Co.
Woburn Degreasing Co.
Woburn Chemical Corp.

In addition, any information your office may have pertaining to the following Site Remediation Program sites in Kearny would also be of use to me:

HMDC Sanitary Landfill 1A
Belleville Turnpike and Harrison Ave.
NJD981877715
BFO-CA

Municipal Sanitary Landfill Authority
1500 Harrison Ave.
NJD981877673
BFO-CA

Route 508 and NJ Turnpike
Route 508 (Harrison Ave.) and Turnpike Exit 15W
NJL000010157
BFCM

Please call me to arrange a time for this review.

Sincerely,

Michael McGowan

Michael McGowan
Geologist

jmz geology
consulting geologists
43 Emery Avenue, Flemington, New Jersey 08822 (908) 788-0505

April 20, 2000

Mr. Sukhdev Bhalla
NJDEP - Division of Solid and Hazardous Waste
Bureau of Landfill & Recycling Management
P.O. Box 414
401 East State Street
Trenton, NJ 08625-0414

Re: Request for File Review

Dear Mr. Bhalla:

I would like to review any files the Bureau of Landfill & Recycling Management may have pertaining to the following sites:

1200 Harrison Ave.
Kearny, Hudson County, NJ
Block 275 Lot 1

HMDC Sanitary Landfill 1A
Belleville Turnpike and Harrison Ave.
NJD981877715

Municipal Sanitary Landfill Authority
1500 Harrison Ave.
NJD981877673

Route 508 and NJ Turnpike
Route 508 (Harrison Ave.) and Turnpike Exit 15W
NJL000010157

Please call me to arrange a time for this review.

Sincerely,

Michael McGowan

Michael McGowan
Geologist

amz geology
consulting geologists
43 Emery Avenue, Flemington, New Jersey 08822 (908) 788-0505

April 19, 2000

Ms. Ida Englehardt
NJDEP
Office of Legal Affairs
P.O. Box 402
401 East State Street, 4th Floor
Trenton, NJ 08625-0402

Re: Request for File Review

Dear Ms. Englehardt:

I would like to review any files the Division of Legal Affairs may have pertaining to the following property:

1200 Harrison Ave.
Kearny, Hudson County, NJ
Block 275 Lot 1
Current Owner: 4Bs Investments, Vineland, NJ
Former Owners: Walker Chemical Co.
Woburn Degreasing Co.
Woburn Chemical Corp.

Please call me and let me know if any files exist for this site and to arrange a time for their review.

Sincerely,

Michael McGowan

Michael McGowan
Geologist

amz geology
consulting geologists
43 Emery Avenue, Flemington, New Jersey 08822 (908) 788-0505

April 19, 2000

Mr. Rich Yarsinsky, Records Custodian
NJDEP - Division of Responsible Party Site Remediation
P.O. Box 028
401 East State Street
Trenton, NJ 08625-0028

Re: Request for File Review

Dear Mr. Yarsinsky:

I would like to review any files the Division of Responsible Party Site Remediation may have pertaining to the following property:

1200 Harrison Ave.
Kearny, Hudson County, NJ
Block 275 Lot 1
Current Owner: 4Bs Investments, Vineland, NJ
Former Owners: Walker Chemical Co.
Woburn Degreasing Co.
Woburn Chemical Corp.

Please call me and let me know if any files exist for this site and to arrange a time for their review.

Sincerely,

Michael McGowan

Michael McGowan
Geologist

amz geology
consulting geologists
43 Emery Avenue, Flemington, New Jersey 08822 (908) 788-0505

April 19,2000

Mr. Dennis Hart
NJDEP - Division of Water Quality
P.O. Box 029
401 East State Street
Trenton, NJ 08625-0029

Re: Request for File Review

Dear Mr. Hart:

I would like to review any files the Division of Water Quality may have pertaining to the following property:

1200 Harrison Ave.
Kearny, Hudson County, NJ
Block 275 Lot 1
Current Owner: 4Bs Investments, Vineland, NJ
Former Owners: Walker Chemical Co.
Woburn Degreasing Co.
Woburn Chemical Corp.

Please call me and let me know if any files exist for this site and to arrange a time for their review.

Sincerely,

Michael McGowan

Michael McGowan
Geologist

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

Division of Responsible Party Site Remediation
Bureau of Field Operations - Northern Regional Office
2 Babcock Place
West Orange NJ 07052

May 4, 2000

Michael McGowan
JMZ Geology
43 Emery Avenue
Flemington, NJ 08822

Re: Public Records Request - 1200 HARRISON AVENUE, KEARNY
HUDSON COUNTY

Dear Mr. McGowan:

In response to your recent letter addressed to NJDEP/BFO-N, please be advised that the Division of Responsible Party Site Remediation, Northern Regional Office, does not have files or information regarding the above-mentioned properties.
Should you have any further questions, please feel free to contact me at (973)669-3960.

Sincerely,

Eyllin Pombo

State of New Jersey
Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

June 12, 2000

Michael McGowan
JMZ Geology
43 Emery Avenue
Flemington, NJ 08822

RE: Request for Information, Reference No. 00-879
1200 Harrison Avenue, Kearny, Hudson County, NJ, Block 275, Lot 1, Owner\4Bs Investments, Vineland, NJ, Former Owners\Walker Chemcial Co., Woburn Degreasing Co., Woburn Chemical Corp.

Dear Mr. McGowan:

The Bureau of Community Relations has no files on the above request.

Sincerely,

Fay Brown

Fay Brown
Bureau of Community Relations

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
GENERAL SERVICES
CENTRAL SERVICES AND PROPERTY MANAGEMENT
CN420
TRENTON, NJ 08625-0420

05/16/00

JMZ GEOLOGY
43 EMERY AVE.,
FLEMINGTON, NJ 08822
Attn: MICHAEL MCGOWAN

RE: OLA Reference #: 0000879
1200 HARRISON AVE., KEARNY, HUDSON CO, NJ 4BS INVESTMENTS, VINELAND, NJ -WALKER CHEMICAL CO., WOBURN DEGREASING CO., WOBURN CHEMICAL CORP.

Dear MR. MCGOWAN,

This is in response to your firm's request for information pertaining to the above referenced site or subject.

The New Jersey Department of Environmental Protection Central File Unit maintains files for the Division of Publicly Funded Site Remediation, Division of Solid Waste Management, Division of Water Quality. Please keep in mind that the Central Files for any of these programs are NOT all inclusive.

A search of these records shows that there is no information in the Central Files which pertains to your request.

The Central Files also house a collection of "General Municipality" files which contain information from the Water Enforcement Field offices for unpermitted facilities/incidents. The documents in these files do not have any permit numbers associated with them so they are categorized by location. These files MAY OR MAY NOT contain information related to your request.

If you wish to schedule an appointment or review the municipality file(s) for the site(s) you requested please contact this office at (609) 292-0400.

If you need any further assistance please feel free to call.

Central Files
Bureau of Central Services &
Property Management

EPA United States Environmental Protection Agency **Superfund**

Record of Decision (ROD) Abstract

ROD Number: EPA/ROD/R01-86/020
ROD Date: 09/30/86

Site: **INDUSTRI-PLEX** *EPA ID Number:* **MAD076580950**
Location: **WOBURN, MA** *Operable Unit:* **01**

Abstract:
THE INDUSTRI-PLEX SITE IS A 245-ACRE INDUSTRIAL PARK LOCATED IN WOBURN, MASSACHUSETTS. VARIOUS MANUFACTURING FACILITIES OPERATED ON THE SITE FROM 1853 TO 1968. DURING THESE YEARS THE SITE HAS SUPPORTED MANUFACTURERS OF SULFURIC ACID (AND RELATED CHEMICALS), ANIMAL HIDE GLUE, ARSENIC INSECTICIDES, ACETIC ACID, DRY COLORS AND MUNITIONS; AND PRODUCERS OF ORGANIC CHEMICALS INCLUDING PHENOL, BENZENE AND TOLUENES. PRIOR TO 1934, WASTE MATERIALS APPEAR TO HAVE BEEN RANDOMLY DISPOSED OF OVER A WIDE AREA. THE WASTES WERE USED TO FILL LOWLANDS, WETLANDS AND SHALLOW PONDS, AND AS CONSTRUCTION MATERIAL TO BUILD DIKES AND LEVEES TO CONTAIN LIQUID WASTES. AFTER 1934 WASTES WERE DEPOSITED DIRECTLY ON TOP OF THE EXISTING DEPOSITS AND REACHED HEIGHTS IN EXCESS OF FORTY FEET ABOVE NATURAL GRADE. THE PRESENCE OF HAZARDOUS SUBSTANCES WAS DETECTED IN 1979 WHEN THE CURRENT OWNER OF THE SITE, MARK PHILLIP TRUST, BEGAN DEVELOPING PORTIONS OF THE SITE. AS SITE DEVELOPMENT BEGAN TO ENCROACH ON THE BURIED ANIMAL GLUE MANUFACTURING WASTES, A VERY STRONG AND PERVASIVE "ROTTEN EGG" ODOR WAS RELEASED. DESPITE REPEATED CITIZEN COMPLAINTS AND NOTICES OF VIOLATIONS ISSUED BY THE MDQE, THE TRUST CONTINUED ITS DEVELOPMENT OF THE SITE. PORTIONS OF STOCKPILED WASTES SLOUGHED OFF, RELEASING HYDROGEN SULFIDE GASES TO THE ATMOSPHERE AND TOXIC METALS AND SOILS TO THE POND AND WETLANDS. LARGE AREAS OF THE CONTAMINATED SOILS ARE EXPOSED AT THE SURFACE THEREBY ALLOWING INDIVIDUALS AND ANIMALS TO COME IN DIRECT CONTACT WITH ARSENIC, CHROMIUM AND LEAD. OTHER CONTAMINANTS OF CONCERN INCLUDE BENZENE AND TOLUENE. THE SELECTED REMEDIAL ALTERNATIVE FOR THIS SITE INCLUDES THE FOLLOWING ACTIONS. FOR CONTAMINATED SOILS AND SLUDGES; SITE GRADING; INSTALLATION OF A PERMEABLE SOIL COVER CAP OVER CERTAIN AREAS; IMPLEMENTATION OF INSTITUTIONAL CONTROLS; WATER QUALITY MONITORING; AND POST CLOSURE MAINTENANCE CONSISTENT WITH RCRA REGULATIONS. FOR GROUND WATER; AN INTERIM REMEDY OF PUMPING "HOT SPOT" AREAS AND GROUND WATER TREATMENT TO CONTROL ODORS, AIR STRIPPING TO REMOVE VOCS AND DISCHARGE TO THE UPGRADIENT PORTION OF THE AQUIFER; AND GROUND WATER MONITORING. FOR AIR; STABILIZATION OF THE SIDE SLOPES OF THE EAST AND WEST HIDE PILES; INSTALLATION OF A GAS COLLECTION LAYER; INSTALLATION OF A SYNTHETIC MEMBRANE CAP TO ESTABLISH IMPERMEABILITY; AND TREATMENT OF GASEOUS EMISSIONS WITH EITHER ACTIVATED CARBON OR THERMAL OXIDATION WITH THE FINAL TREATMENT SELECTION TO BE DECIDED AFTER THE IMPERMEABLE COVER HAS BEEN INSTALLED;

IMPLEMENTATION OF AIR QUALITY MONITORING PROGRAM; AND ROUTINE MAINTENANCE. THE ESTIMATED CAPITAL COST FOR THE ENTIRE REMEDIAL ACTION IS $12,302,300 OR $12,612,000 DEPENDING ON AIR TREATMENT WITH ANNUAL O&M OF $285,500 OR $311,000 DEPENDING ON AIR TREATMENT.

Remedy:

REMEDY IS IN TEXT FIELD WITH SEGMENT MARKER #REM.

URL: http://www.epa.gov/superfund/sites/query/rods/r0186020.htm

Last Updated: January 14, 1999

United States
Environmental Protection
Agency

INDUSTRI-PLEX

MASSACHUSETTS
EPA ID# MAD076580950
EPA REGION 1
Middlesex County North Woburn

Other Names: Mark Phillip Trust
Woburn Site
Industri-Plex 128 Site

Site Description

The Industri-Plex site is a 245-acre industrial park. From 1853 to 1931, the site was used for manufacturing chemicals such as lead-arsenic insecticides, acetic acid, and sulfuric acid for local textile, leather, and paper manufacturing industries. Chemicals manufactured by other industries at the site include phenol, benzene, and toluene. From 1934 to 1969, the site was used to manufacture glue from raw animal hide and chrome-tanned hide wastes. The by-products and residues from these industries caused the soils within the site to become contaminated with elevated levels of metals, such as arsenic, lead and chrome. From 1969 to 1980, the site was developed for industrial use. Excavation in the 1970's uncovered and mixed industrial by-products and wastes accumulated over 130 years. During this period, residues from animal hide wastes used in the manufacture of glue were relocated on-site from buried pits to piles near swampy areas on the property. Many of the animal hide piles and lagoons on-site were leaching toxic metals into the environment. In the 1980's, the site contained streams and ponds, a warehouse and office buildings, remnant manufacturing buildings, and hide waste deposits buried on the site. Animal hide residues are found on approximately 20 acres of the site in four different piles. Portions of the animal hide piles sloughed off, causing the release of hydrogen sulfide gases to the atmosphere and toxic metals to surrounding wetlands. Residences are located within 1,000 feet of the site, and more than 34,000 people live within 3 miles of the site.

Site Responsibility: The site is being addressed through Federal and potentially responsible parties' actions.

NPL LISTING HISTORY

Proposed Date: 10/23/81

Final Date: 09/08/83

Threats and Contaminants

The groundwater is contaminated with volatile organic compounds (VOCs) including benzene and toluene, and arsenic. The soil is contaminated with heavy metals including arsenic, chromium, and lead. Also, a pervasive "rotten egg" odor has been caused by hydrogen sulfide gas generated by the decay of the buried animal hides from glue manufacturing wastes. People who accidentally ingest or come into contact with contaminants may be at risk. However, since the site is mostly vacant with plans for industrial and commercial use, the potential exposure most likely is limited to trespassers and workers on the site during future construction. The contaminated groundwater has the potential to migrate towards two Woburn municipal drinking wells, which are currently closed. Wetlands near the site are threatened by site runoff.
Cleanup Approach

The site is being addressed in three stages: initial actions and two long-term remedial phases focusing on site stabilization and cleanup of groundwater contamination.

Response Action Status

Initial Actions: In 1986, the EPA installed 10,000 feet of fence to restrict site access. Extensive damage to the main areas of the fence occurred, and drums were dumped illegally on the site. Areas of the fence requiring repairs were identified by the EPA, and work to re-secure the site was completed in 1988. Warning signs also were posted.

Site Stabilization: In 1986, the EPA selected a cleanup remedy that is being implemented by the potentially responsible parties (PRPs). The remedy includes the following: 1) Design and construct permeable caps over approximately 105 acres of soils and sediments contaminated with lead, arsenic, and chromium in excessive levels of 300 parts per million (ppm), 600 ppm, and 1000 ppm, respectively. The permeable caps may consist of various designed covers containing 16 inches of clean fill and a geotextile fabric placed over the contaminated soils and sediments, as well as equivalent covers such as concrete foundations or bituminous parking lots. This portion of the remedy serves to prevent physical contact with the contaminated soils and sediments, including the West, East-Central and South Hide Piles; 2) Design and construct an impermeable cap over the approximately 5 acres of East Hide Pile, and gas collection and treatment system. This portion of the remedy serves to prevent the infiltration of water through the hide pile, and prevent the release of hydrogen gases into the atmosphere; 3) Design and construct an interim groundwater treatment system to treat a groundwater hot spot contaminated with toluene and benzene. This interim system is designed to reduce the concentration of the hot spot by eighty percent and limit contamination migration off-site; 4) Conduct a Groundwater and Surface Water Investigation Plan (GSIP) to evaluate the degree of groundwater and surface water contamination from the site; and 5) Design and implement Institutional Controls for the site which will restrict future land use on the property. The purpose of the Institutional Controls is to preserve the effectiveness of the remedy, so that human health and the environment remains protected, and allow each property owner the fullest possible use of their property. The PRPs began designing the cleanup remedies in 1989. Design of the site permeable and impermeable cap was finalized in 1992. Construction of the permeable and impermeable cap began in 1993. Currently, the impermeable cap, gas collection and treatment system, and the permeable cap are complete. Cover certification reports, which document the proper installation of the protective caps, remain to be completed for each property on the Site. The design of the interim groundwater treatment system was completed initially in the fall of 1992; however, the system was altered to reflect changes resulting from a pilot air sparging design in 1993. The pilot air sparging system was designed and operational for a short period in the summer of 1994, when it was discovered that the system failed to meet the design standards. Currently, other innovative approaches to treatment are being evaluated, such as in-situ oxygen injection. The potentially responsible parties have conducted two phases of the GSIP and are preparing to implement a comprehensive third investigation (see below). In 1995, EPA established a working group for the institutional controls consisting of state, landowner, and potentially responsible party representatives, and the group established a draft outline. A number of draft institutional control documents have been developed, and EPA and DEP are currently scheduling meetings to finalize the institutional controls. The institutional controls document is being rearranged to reflect the Massachusetts Contingency Plan (MCP) Activity and Use Limitations (AULs) format, and is expected to be finalized in 2000.

Groundwater Contamination: In 1990, the potentially responsible parties began the GSIP investigation into the nature and extent of the site-related groundwater, surface water and sediment contamination. The potentially responsible parties completed two investigations and prepared a GSIP Phase 1 and 2 Report. In the Fall of 1998, EPA completed negotiations with the potentially responsible parties regarding the Industri-Plex Consent Decree requirements and content of a more comprehensive investigation. The potentially responsible parties agreed to implement a comprehensive investigation, entitled the Final GSIP, which investigates the extent of site-related metals and organics contamination in groundwater, surface water, and sediments from the Site, and evaluates any environmental and human health risks posed by the contamination. In 1999, the parties implemented a portion of the Final GSIP by collecting various surface water, sediment, and fish samples from the Halls Brook Holding Area (HBHA), which merges with the Aberjona River at Mishawum Road, Woburn, MA. The parties will continue to implement the Final GSIP throughout the year 2000.

In addition, the 1986 Record of Decision (ROD) required EPA to conduct a Multiple Source Groundwater Response Plan (MSGRP). The MSGRP was required to investigate other potential contamination impacts on the area wide aquifer, and determine if additional remedies may be necessary to clean up the aquifer within the Industri-Plex Study Area. The approximate boundaries of the Industri-Plex Study Area include the Woburn/Wilmington Town Line to the north, Route 128/Interstate 95 to the south, Interstate 93 to the east, and the Massachusetts Bay Transit Authority (MBTA) Right of Way for the Lowell-Boston Commuter Rail to the west. The MSGRP would incorporate the data collected by the PRPs under the GSIP, and serve as a comprehensive RI/FS supporting a future ROD for the aquifer and any residual surface water and sediment contamination within the Industri-Plex Study Area. In 1997, the EPA prepared a Preliminary MSGRP Report based upon existing analytical data. In August 1998, EPA prepared a Historical Aerial Photographical Analysis of the Industri-Plex Study Area, illustrating property use and watershed changes since 1938. In 1999, EPA also evaluated the preliminary surface water and sediment data collected from the Wells G&H Operable Unit 3 (OU-3), Aberjona River Study. The Aberjona River Study collected surface water and sediment samples from the Wells G&H Site in Central Woburn to the Mystic Lakes in Winchester, which are located immediately downstream of the Industri-Plex Study Area. The preliminary Aberjona River Study data indicates the primary contaminants of concern in the surface water and sediments are metals. Based upon these preliminary reports and data, EPA is merging the MSGRP data and the Wells G&H OU-3, Aberjona River Study data, into one comprehensive Remedial Investigation/Feasibility Study (RI/FS) for the entire river system. The comprehensive RI/FS will collect additional environmental samples from the river to fill in any significant data gaps in the Wells G&H OU-3, Aberjona River Study, and the Industri-Plex GSIP, and collect additional groundwater data to evaluate other potential groundwater sources within the Industri-Plex Study Area. The implementation of the MSGRP environmental sampling program should begin this Spring or Summer, and conclude within 12 months.

Site Facts: In 1979, in response to illegal filling of wetlands, the EPA obtained a court order to stop further development activities. The EPA and the State entered into a Consent Order with Stauffer Chemical in 1982, whereby Stauffer was to conduct an investigation and recommend cleanup actions. In 1989, the EPA and the potentially responsible parties signed a Consent Decree in which the parties agreed to implement the remedy for stabilizing the site and to reimburse the EPA for past and future oversight costs.

Environmental Progress

Fencing and posting warning signs around the site have restricted access to the Industri-Plex site and made it safer while final cleanup activities continue. Upon completion of the final cleanup remedies, the soil and groundwater contamination levels at the Industri-Plex site will be reduced to meet established health and ecological standards. At the same time remediation has been proceeding, significant portions of the site are being developed or redeveloped for economic reuse.

The Custodial Trust (Trust created by EPA and PRPs in the 1989 Consent Decree to hold, manage and sell developable property on the site), EPA, and PRPs are working with state, local governments, prospective purchasers, and developers to establish some commercial re-development on the site. In 1996, EPA modified the permeable cap design for a 36 acre portion of the site to accommodate the construction of a 2,400 vehicle Regional Transportation Center (RTC) on the site. Implementation of the design modification will improve the protectiveness of the remedy by increasing the depth of the permeable cap's clean fill to approximately 48 inches, including an asphalt parking lot. The RTC will also facilitate compliance with the Clean Air Act by removing 2,400 vehicles from the interstate and reducing vehicle air emissions in the metropolitan Boston area. The construction of the alternative RTC design cap was completed in early 1997. EPA has entered into five Prospective Purchaser Agreements (PPA) with purchasers of five different parcels on the site, which protect those parties from Superfund liability related to the existing environmental conditions.

The first PPA was entered in 1996 with Vining Disposal, Inc. (Vining), for a property that had already been developed. Since the property sale, Vining has been operating a recycling center at the property.

A second PPA was entered in December 1996, with the Massachusetts Port Authority (MPA), Massachusetts Bay Transportation Authority (MBTA), and Massachusetts Highway Department (MHD) for the RTC 36 acre property. This PPA required the parties to construct the above alternative RTC Design cap, adhere to the institutional controls for the site, and provide access for any future Superfund activities. Currently, the RTC construction is expected to begin early in 2000.

A third PPA was entered in 1997, with a prospective purchaser for a 29.6 acre (19.0 buildable acres) retail property on the site. On December 12, 1997, Dayton-Hudson Corporation purchased the retail property, and Target Stores will anchor the property's retail development. Construction schedule for the Target Store development will parallel the Interstate 93 (I-93) interchange schedule (described below), so that both developments will be completed at the same time. Other prospective re-development opportunities are underway at the site, including a public road (Commerce Way) extension and improvement, and an innovative I-93 interchange through the site to alleviate traffic congestion at the intersection of I-93 and I-95, improve traffic conditions in the City of Woburn, and provide access to the RTC. Construction of the Commerce Way extension and improvements and I-93 Interchange began in 1997 and are expected to be completed in 2000.

A fourth PPA was entered in August 1999, with 100 Metro-North Corporation (affiliate of National Development of

New England, Inc.) for approximately 50 acres on the Site. The parcel will be developed for commercial office park, hotel, and restaurant use, and be anchored by GTE Corporation. A portion of the GTE commercial development construction began in 1999, and is expected to be completed in 2000.

The fifth PPA was entered in March 2000, with Transcom, Inc. (Transcom), for 2 acres of property that had already been developed. Transcom is expected to use the property's building and parking lot for its business operations. Transcom is anticipated to begin its operations immediately.

All of these proposed developments are not expected to impact the remedy, and will comply with EPA approved/accepted construction specifications, work plans, health and safety plans, and established institutional controls.

Site Repository

Reading Public Library, 45 Pleasant Street, Woburn, MA 01801 (617) 937-01482

Return to the list of superfund sites.

METADATA

TITLE: National Priorities List (NPL) Site Summary Sheets

IDENTIFICATION NUMBER: N/A

ABSTRACT: Site Summary Sheets provide general information on NPL sites located in EPA Region 1

PURPOSE: To provide information on progress at Region I NPL Sites

ORIGINATOR: Remedial Project Manager (RPM)

PUBLICATION DATE OF PAPER DOCUMENT: 01/01/00

ACCESS CONSTRAINTS: Read Only/Download

AVAILABILITY: Contact Patti Ludwig, Region I Data Administrator at (617) 918-1245

COVERAGE: N/A

LEFT MESSAGE 5/31

TIME PERIOD OF COVERAGE: 01/01/00 - 12/31/00

POINT OF CONTACT FOR MORE INFORMATION: Joseph LeMay, RPM (617) 918-1323

RESPONSIBLE PARTY: N/A

DATE OF WEB DOCUMENT CREATION: 04/12/00

AGENCY SUPPLEMENT INFORMATION: N/A

EXPIRATION DATE: 12/31/00

ANNA MAIER 617-556-1112

- Dan Coughlin 617 918-1321

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

ARGEO PAUL CELLUCCI
Governor

JANE SWIFT
Lieutenant Governor

BOB DURAND
Secretary

LAUREN A. LISS
Commissioner

Fax

To:	Mike McGowan	**From:**	Anna Mayor
Fax:	908-788-0388	**Phone:**	617-556-1112
Phone:	908-788-0505	**Date:**	07/27/00
Re:	Woburn Chemical Company	**Pages:**	2

☐ **Urgent** x **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

• **Comments:** Mr. McGowan:

Thank you for your phone message. I left a note with your colleague that the Woburn Chemical Company is not a PRP at the Industri-Plex Superfund Site (the Site); at least they are not listed as defendants on the Consent Decree. I also suggested you may find useful information through the Woburn Chamber of Commerce at 781-933-3499.

I then looked through the history that is contained in the Record of Decision (ROD) for the Site, and saw a reference that might interest you. I have attached the page of interest from the ROD. I don't know if the Woburn Chemical Works mentioned has anything to do with the Woburn Chemical Company that you are interested in. Hope that helps. If you have any questions, please don't hesitate to give me a call at 617-556-1112.

Anna

same as Woburn Chemical company?

In February 1853, Robert Eaton purchased approximately 105 acres in North Woburn to establish the Woburn Chemical Works. Operations began in the summer of 1853 with the manufacture of chemicals for the local textile, leather and paper industries. In 1863 Robert Eaton joined three other individuals to form a company called Merrimac Chemical Company. This company continued to operate and expand the existing facilities.

During the period of 1853-1890, the main products of the Merrimac Chemical Company were sulfuric acid and related chemicals. At this time, sulfuric acid was the key to most chemical production, being the intermediate for many chemicals required by the previously mentioned industries.

In 1899, Merrimac purchased the William H. Swift Company (East Boston), a producer of arsenic insecticides, acetic acid and dry colors. Between 1899 and 1915, Merrimac became the leading U.S. producer of arsenic insecticides.

In 1915, Merrimac organized a separate company, located just east of the main plant, called the New England Manufacturing Company. The purpose of New England Manufacturing Company was to produce war materials, specifically munitions for World War I. Merrimac Chemical Company supplied New England Manufacturing Company with acid by a pipeline. New England Manufacturing produced organic chemicals, including phenol, benzene, picric acid and toluene and trinitrotoluene (TNT). During this period of time, Merrimac Chemical Company also acquired the entire plant, assets and goodwill of the Cochrane Chemical Company of Everett, Massachusetts.

In November, 1929, the Monsanto Chemical Works of St. Louis purchased and merged with the Merrimac Chemical Company. Merrimac was allowed to retain its identity as the Merrimac Division of Monsanto and continued to operate at the Site until 1931. By 1931 all Merrimac operations located in Woburn were consolidated to the Merrimac plant in Everett. From 1931 to 1934, no operations were conducted on the Site. Existing equipment was salvaged by F & L Land Salvage and, in 1934, the Site was sold to New England Chemical Industries.

From 1853 until 1929 the Site development was characterized by numerous small buildings scattered over 90 acres. Old maps of the Site show that these buildings were built or destroyed as quickly as there were changes in the demand for certain chemicals. It appears, based on a historical search and visual observations, that waste products were disposed of randomly over the years, usually wherever it was convenient, either to fill in a low spot or out behind a building.

New England Chemical began construction of an animal hide glue manufacturing plant on the site in 1934, and started up the plant in March, 1935. New England Chemical Company was purchased by Consolidated Chemical Company in 1936. Consolidated was

Universal Flavors

Discharge Investigation and Corrective Action Report

Universal Flavors
Kearny, New Jersey

NJDEP-BUST Case #90-04-04-1453

December 1990

Prepared for:

Universal Foods Corporation
6143 N. 60th St.
Milwaukee, WI 53218

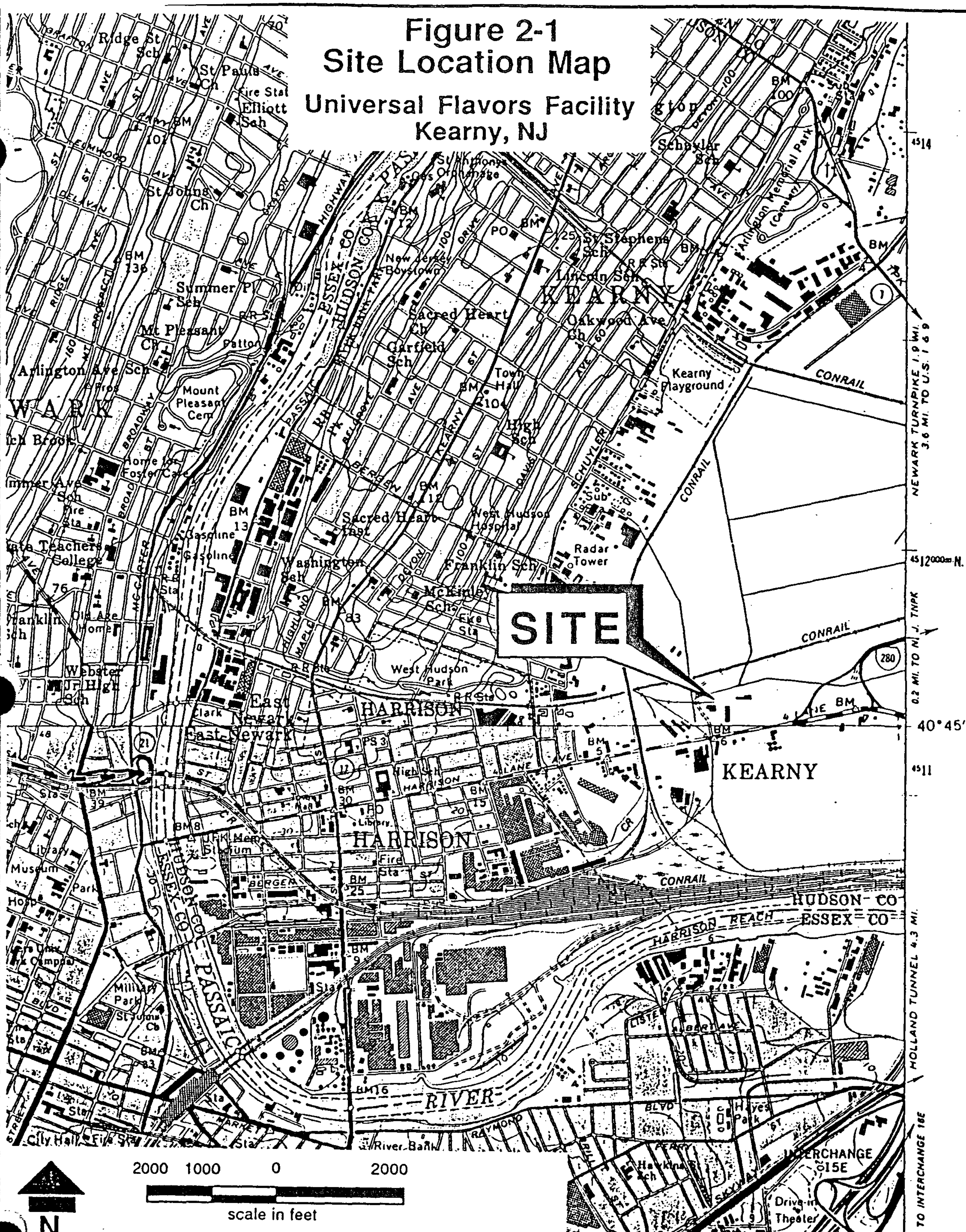
Prepared by:

ERM-EnviroClean, Inc.
855 Springdale Drive
Exton, PA 19341

File: 990-62-10-01

The ERM Group

Figure 2-1
Site Location Map
Universal Flavors Facility
Kearny, NJ



Source: USGS Topographic Quadrangles: Orange, NJ; Elizabeth, NJ-NY

The ERM Group

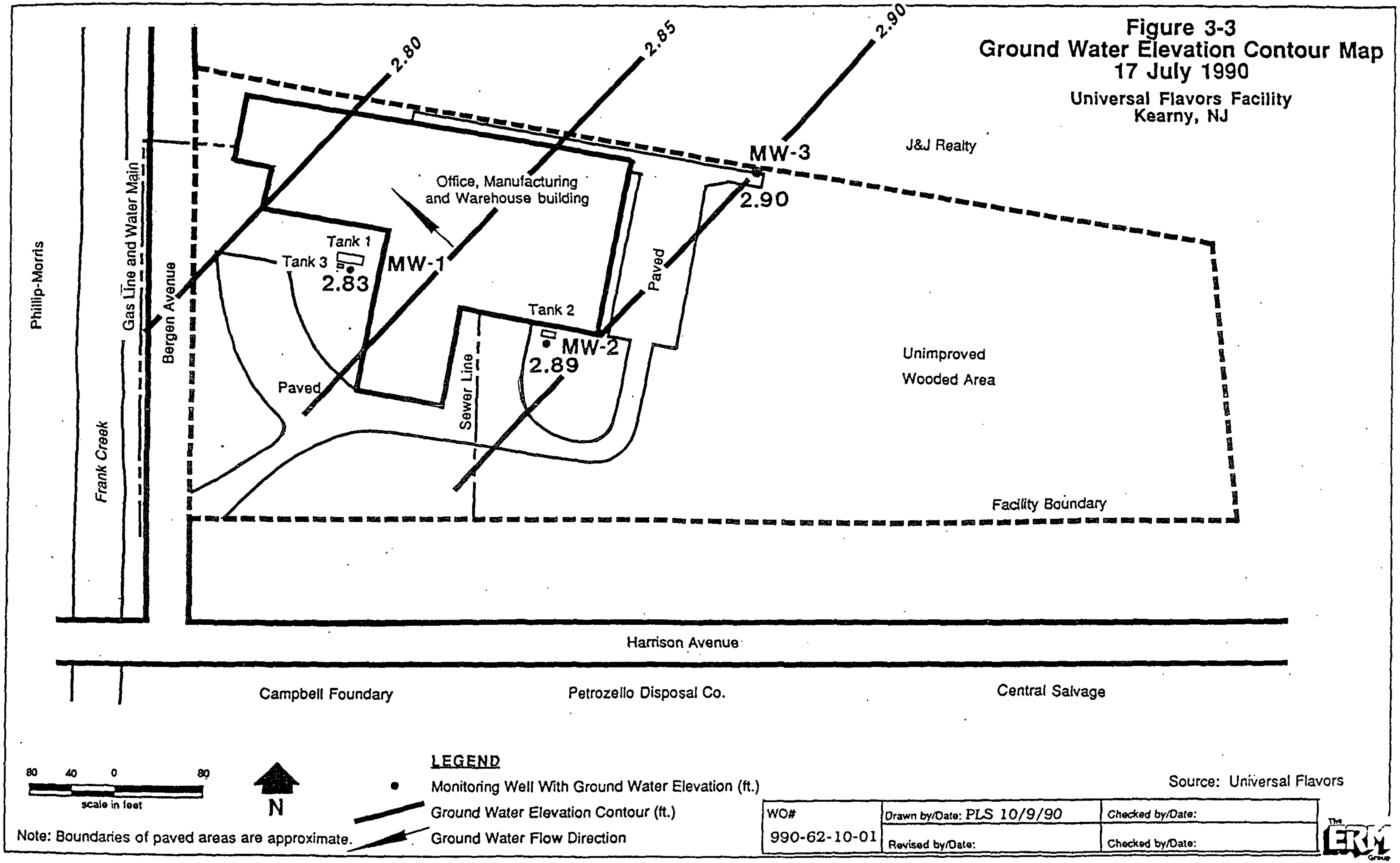


Figure 3-3
Ground Water Elevation Contour Map
17 July 1990
Universal Flavors Facility
Kearny, NJ

Environmental Resources Management, Inc.

Drilling Log

Project: Universal Flavors - Kearny **Owner:** Universal Foods

Location: Kearny, N.J. **W.O. Number:** 990-62-10-01

Well Number: MW-3 **Total Depth:** 14'

Surface Elev.: 6.41' **Depth to Water:** 2.34'

Screen: Dia. 4" **Length:** 12' **Slot Size:** .020

Casing: Dia. 4" **Length:** 2' **Type:** PVC

Drilling Co.: Hardin-Huber **Drilling Method:** Auger

Driller: Bill Wilkerson **Logged By:** G. Smith **Date Finished:** 6/14/90

Notes: Completed with a flush mount.

Depth (ft.)	Well Const.	Blows	Recovery (ft.)	Description / Soil Classification (color, texture, structure)	Head-space OVA (ppm)
0–2		6, 9, 14, 11	0.8'	FILL - light tan to grey pebbles up to 1", and light greenish grey to medium brown fine sand, slightly moist.	
2–4		4, 4, 4, 4	0.5'	FILL - blue-grey coarse sand, silty, clayey, abundant angular pebbles to 1", wet.	
4–6		1, 2, 1, 2	0.5'	FILL - Fragements of glass and brick.	
6–8		1, 1, 1, 1	1.5'	UPPER 0.6' - FILL - as above. LOWER 0.9' - PEAT - black, organic matter, abundant plant and root fragments, possible hydrocarbon odor.	
8–10		1, 1, 2, 2	1.7'	UPPER 0.5' - pebbles, sand, and wood fragments. LOWER 1.7' - CLAY - medium brown, sandy, with plant fragment.	30
10–12		0, 6 10, 6	1.5'	SAND - medium brown to reddish brown, medium grained, well sorted to silty, possbile hydrocarbon staining?	
12–14		5, 3, 5, 7	2.0'	SAND - dark to medium brown to light grey, medium to coarse grained, some silty, occasional pebbles and plant fragments, possible hydrocarbon staining?	

Environmental Resources Management, Inc.

Drilling Log

Project: Universal Flavors - Kearny Owner: Universal Foods

Location: Kearny, N.J. W.O. Number: 990-62-10-01

Well Number: MW-2 Total Depth: 12'

Surface Elev.: 5.69' Depth to Water: 1.68'

Screen: Dia. 4" Length: 10' Slot Size: .020

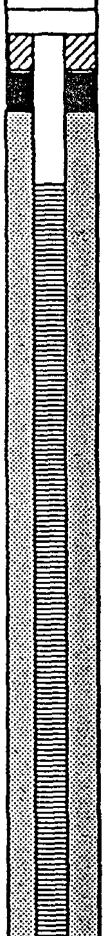
Casing: Dia. 4" Length: 2' Type: PVC

Drilling Co.: Hardin-Huber Drilling Method: Auger

Driller: Bill Wilkerson Logged By: G. Smith Date Finished: 6/14/90

Notes:

Completed with a flush mount.



Depth (ft.)	Blows	Recovery (ft.)	Description / Soil Classification (color, texture, structure)	Head-space OVA (ppm)
0	3, 9, 12, 17	1.9'	FILL - medium to dark brown sand, clay, pebbles, and brick fragments, slightly moist.	35
2	3, 5, 4, 2	0.8'	FILL - dark grey to black, clay to gravel sized material, slightly moist to moist.	110
4	1, 1, 1, 1	0.2'	FILL - light to dark grey clay to gravel sized material, wet.	85
6	1, 1, 1, 1	1.6'	UPPER 0.4' - FILL - pebbles to 1", black, angular. LOWER 1.2' - PEAT - medium brown organic matter.	
8	1, 6, 1, 0	1.8'	UPPER 0.3' - PEBBLES - black, angular to 1", carbonized plant material. LOWER 1.5' - SAND - medium brown to reddish brown, medium to coarse grained, silty, wood fragments.	400
10	12, 5, 10, 0	1.8'	SAND - reddish brown, medium to coarse grained, well sorted, some coal fragments.	22
12				
14				

Environmental Resources Management, Inc.

Drilling Log

Project: Universal Flavors - Kearny Owner: Universal Foods

Location: Kearny, N.J. W.O. Number: 990-62-10-01

Well Number: MW-1 Total Depth: 14'

Surface Elev.: 7.29' Depth to Water: 2.96'

Screen: Dia. 4" Length: 12' Slot Size: .020

Casing: Dia. 4" Length: 2' Type: PVC

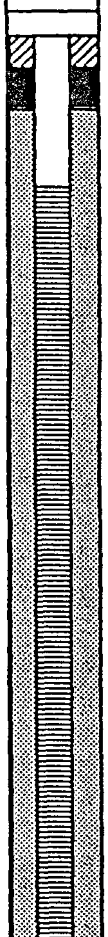
Drilling Co.: Hardin-Huber Drilling Method: Auger

Driller: Bill Wilkerson Logged By: G. Smith Date Finished: 6/15/90

Notes:

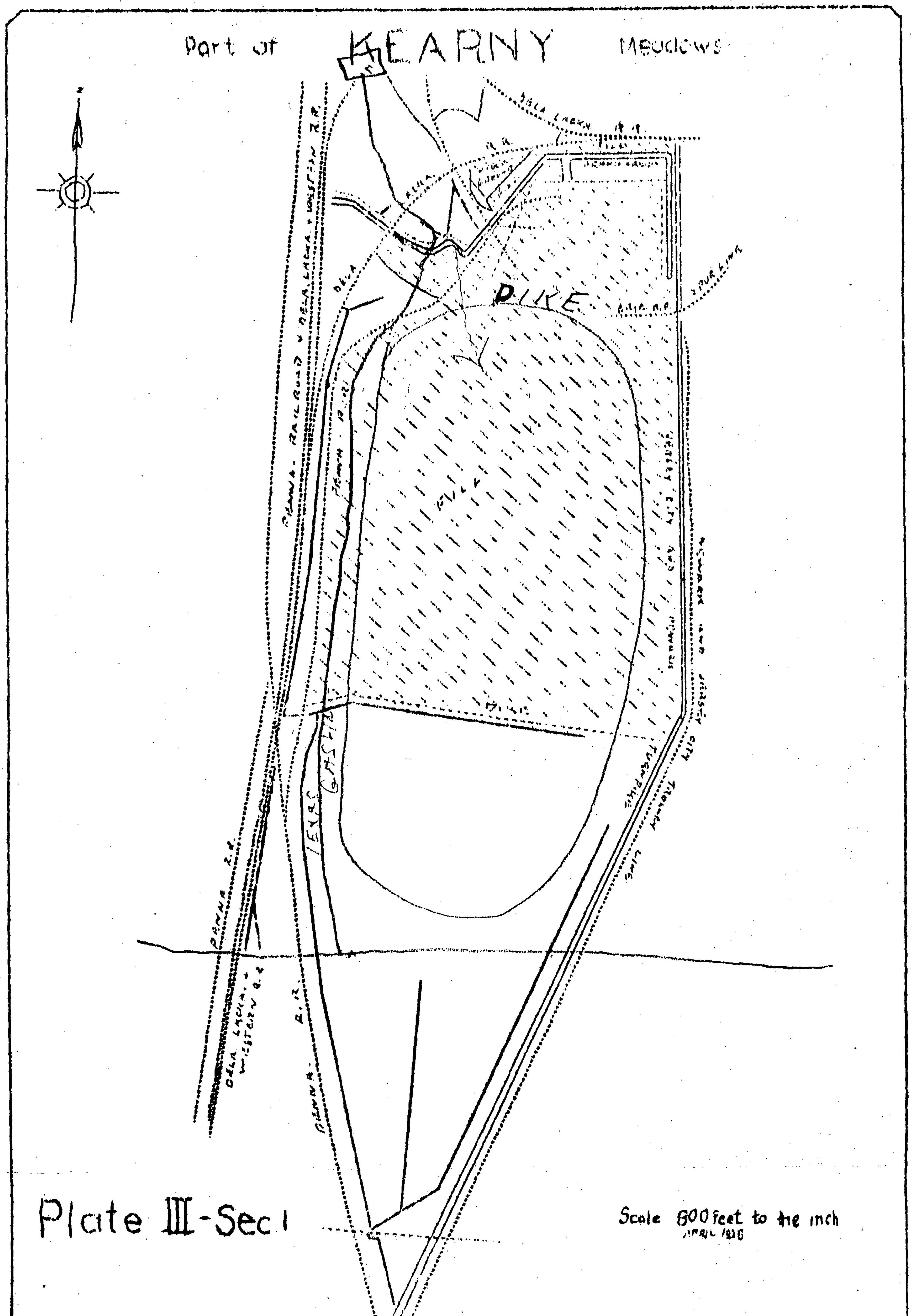
Completed with a flush mount

Well Const.:



Depth (ft.)	Blows	Recovery (ft.)	Description / Soil Classification (color, texture, structure)	Head-space OVA (ppm)
0–2	6, 10, 9, 6	1.2'	FILL - medium tan to dark brown sand, broken glass, bricks, and rock fragments, slightly moist.	<1
2–4	10, 6, 3, 2	1.6'	FILL - reddish brown, medium to coarse grained sand, brick fragments, moist.	0
4–6	1, 2, 2, 2	1.1'	FILL - as above, wet.	0
6–8	1, 6, 0, 1	1.8'	SAND - reddish brown, coarse grained, well sorted, probably fill.	4
8–10	4, 2, 1, 1	1.1'	SAND - reddish brown, coarse grained, some pebbles, probably fill, possible hydrocarbon staining?	12
10–12	3, 2, 1, 1	2.0'	UPPER 0.9' - FILL - reddish brown coarse grained sand with brick fragments. LOWER 1.1' - CLAY - sandy, dark grey, firm, plant fragments, possible hydrocarbon odor.	200
12–14				
14				

C3. Kearny 1 Landfill and Component Sites



REPORT

Date ______________

BREEDING: ____________ Sheet ____________ Ditch ________ Holes ____________

DEG: L.____ M.______ H.________ STAGE: E.______ M.______ A.______ P.______

DISPOSITION OF BREEDING: ____

OIL USED: ____

Kearny 1 Landfill

State of New Jersey

MEMORANDUM

TO: Robert C. Shinn, Jr. Commissioner
Department of Environmental Protection

THROUGH: Richard J. Gimello, Assistant Commissioner
Site Remediation Program

FROM: Anthony J. Farro, Director
Division of Publicly Funded Site Remediation

SUBJECT: MSLA 1-D Landfill Site
January 2000 Progress Report

ʼhe MSLA 1-D Landfill is owned by the Town of Kearny and the property covers approximately 94 acres. It is ɔcated near Exit 15 W of the NJ Turnpike, along Harrison Avenue. The landfill was operated by the Municipal ;anitary Landfill Authority (MSLA) during the 1970s and 1980s. Under administrative order from the DEP the a ceased operations in 1983, but was never properly closed and maintained. Large volumes of leachate flow in n uncontrolled manner off site into adjacent wetlands that discharge into the Passaic River.

ʼhe Bureau of Site Management has engaged its remedial investigation term contractor, Louis Berger & Associates, ıc (LBA), to perform pre-design investigations which will lead to the remedial design of leachate control measures.

ʼhe following milestones are listed for January:

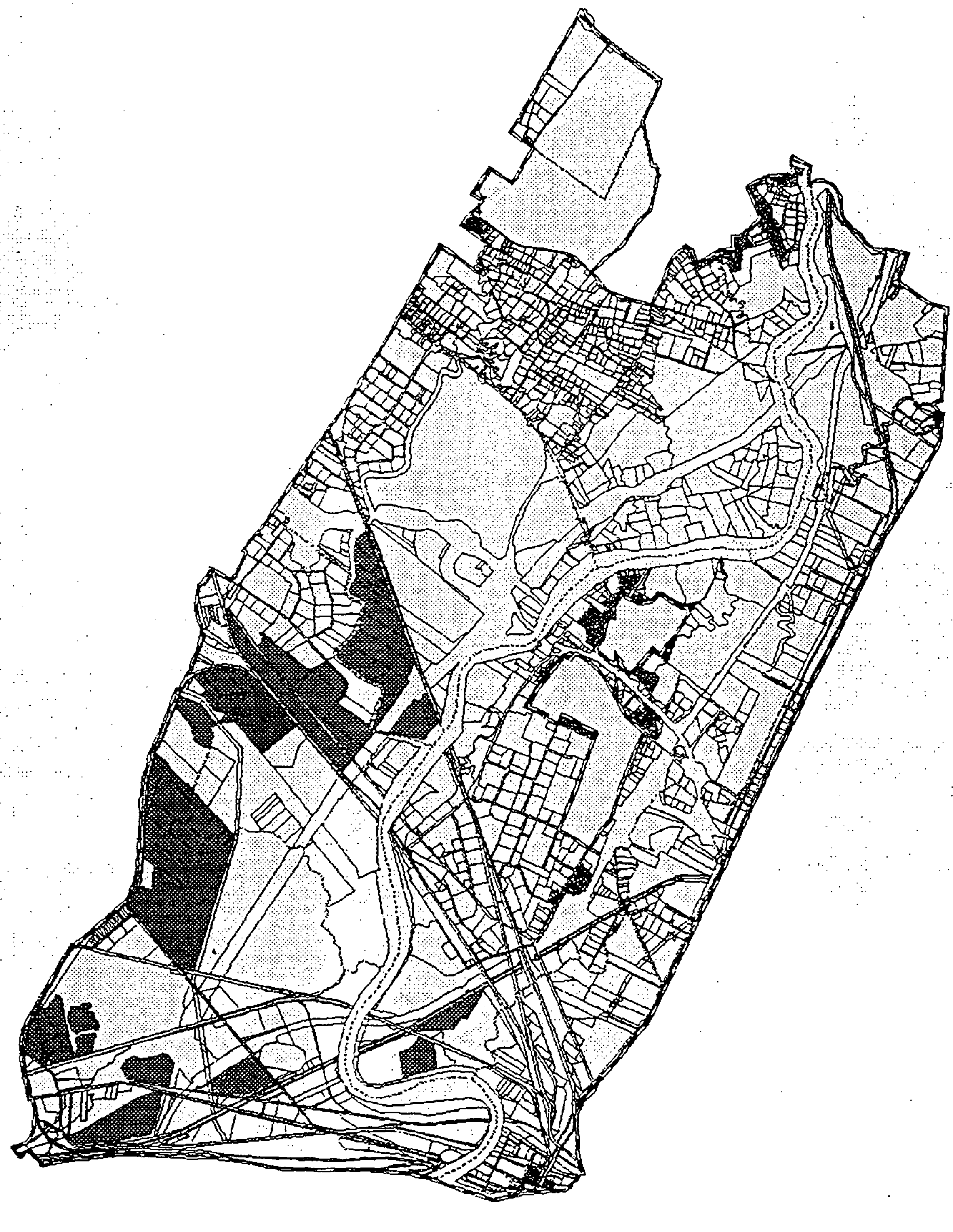
- Requests for Bids (RFBs) documents were prepared to procure the following subcontractors to obtain information for the design of the proposed subsurface barrier wall: drilling; cone penetrometer services; geophysical surveying; analytical testing; and geotechnical testing. RFBs were issued for all services except analytical testing, which should be issued next month.
- A site inspection was held for geophysical bidders' at the site.
- ıe draft Quality Assurance Plan was received and reviewed.
- ıe draft Floodplain Delineation Report was received.
- ırveying work is underway in the field.
- first draft scope-of-work to allow LBA to prepare a design/ build bid package was prepared and is under review.
- A meeting was requested with the Kearny MUA to explore the concept of using them, under a third-party contract, to design, construct, operate, and maintain a leachate pump station and force main proposed at the site. These discussions are expected to take some time. Their outcome also depends on whether the PVSC will accept the landfill leachate.

PVSC has expressed concerns about quality of the leachate at the landfill and their ability to treat it. PVSC has a ban on accepting any PCBs or dioxin. Also, pretreatment may be required for metals and organic compounds. A copy of their comments on the DEP's Remedial Action Plan is attached. We will have to wait until the field sampling and analytical work is completed later this year before these issues can be discussed further with the PVSC.

I hope this report is sufficient to keep you updated. However, if you need any further information or have any questions, please contact me.

attachment

LANDFILLS IN THE HACKENSACK MEADOWLANDS DISTRICT



HMDC

PROJECTION: STATEPLANE
UNITS: FEET
DATUM: NAD83
SOURCE OF DATA: HMDC
DATE: JULY 1999

LEGEND

DISTRICT BOUNDARY
MUNICIPAL BOUNDARY
FUNDED LANDFILLS
ORPHAN LANDFILLS

3900 0 3900
Scale in Feet

State of New Jersey

Department of Environmental Protection

'stine Todd Whitman
/ernor

Robert C. Shinn, Jr.
Commissioner

RECEIVED
NOV 17 1999
LANDFILL AND RECYCLING MGT.

MEMORANDUM

TO: Distribution List

FROM: Michael Burlingame, Site Manager
Bureau of Site Management mB 11/16/99

SUBJECT: MSLA 1D Landfill Site
Remedial Action Plan

Attached, for your information, is a copy of the final Remedial Action plan, dated 11/10/99, for the MSLA 1D Landfill Site. If you have any questions, please feel free to contact me.

Distribution List:
P. Bross, DAG, DL&PS/Division of Law
R. Soboleski, Chief, BSM
D. Kaplan, Geologist, BGWPA
D. Barskey, Technical Coordinator, BEERA
M.A. Goldman, DSHW/BLRM
D. Reinknecht, Construction Manager, BOC
DEP Central File

DECLARATION STATEMENT

REMEDIAL ACTION PLAN

MSLA 1D LANDFILL SITE

SITE NAME AND LOCATION

MSLA 1D Landfill Site located in the Town of Kearny, Hudson County, New Jersey

STATEMENT OF BASIS AND PURPOSE

This Remedial Action Plan presents the selected on-site remedial action for the MSLA 1D Landfill Site located in the Town of Kearny, Hudson County. The investigations which led to this Remedial Action Plan were developed pursuant to the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11a et. seq. (Spill Act). This Remedial Action Plan explains the factual and legal basis for selecting the remedy for this site.

The information supporting this remedial action decision is contained in information repositories which have been established for this site. This Remedial Action Plan contains a Declaration Statement and Decision Summary.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Remedial Action Plan, present an unacceptable risk to public health, welfare, and the environment.

DESCRIPTION OF THE SELECTED REMEDY

The remedial actions described in this document for on-site contamination are divided into two operable units. The first will address landfill leachate. Contaminated leachate has been identified as posing the greatest threats to the human health and the environment. In order to stop the uncontrolled flow of leachate from the landfill into the ground water and adjacent wetlands, a subsurface barrier wall with a leachate collection system will be constructed. The barrier wall will contain the leachate within the footprint of the landfill and a collection system will convey it to the sewage treatment plant for disposal.

This second operable unit will involve capping of the landfill in order to minimize leachate production, manage landfill gases, and to encapsulate contaminated materials on the landfill. The cap will include a methane gas collection system and storm water management controls.

The major components of the proposed remedial actions include the following:

- Construction of a subsurface barrier wall around the landfill to contain leachate.

- Construction of a leachate collection trench on the inboard side of the barrier wall to convey leachate to pump stations and the sewerage treatment plant.
- Regrading of the landfill to promote stormwater runoff.
- Covering the waste materials with an impermeable, solid waste type cap.
- Implementation of storm water management and soil erosion controls.
- Collection of landfill gas under the cap for processing or flaring.
- Fencing and posting of the site.
- Long-term performance monitoring and maintenance of the remedy to insure its effectiveness.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment and complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action. The remedy will employ technologies that are routinely used at landfills in the area, and throughout New Jersey. Once implemented, the goals of the remedy will be achieved immediately. The most cost-effective methods and materials that meet design criteria will be utilized. Construction controls will also be put into practice that to minimize impacts to the surrounding community and the environment.

Richard J. Gimello, Assistant Commissioner
Site Remediation Program
New Jersey Department of Environmentlal Protection

11/10/99
Date

DECISION SUMMARY

MSLA 1D LANDFILL SITE

1. INTRODUCTION

This Remedial Action Plan presents the selected remedy for onsite contamination at the MSLA 1D Landfill Site located in the Town of Kearny, Hudson County. This document is issued by the New Jersey Department of Environmental Protection (NJDEP) and presents the factual and legal basis for the actions proposed herein to address contamination at the site.

This Remedial Action Plan is being issued under the authority of: N.J.S.A. 58:10-23.11a et. seq., entitled the Spill Compensation and Control Act; N.J.S.A. 58:10B-1 et. seq. concerning the remediation of contaminated properties; and N.J.S.A. 58:10A-1 et. seq., entitled the Water Pollution Control Act. The remedy presented in this Plan was developed pursuant to N.J.S.A. 13:1E-1 et. seq., entitled the Solid Waste Management Act, and in accordance with: N.J.A.C. 7:26-2A et. seq. which governs the closure and post-closure care of sanitary landfills, and N.J.A.C. 7:26E, entitled Technical Requirements for Site Remediation, which governs the selection of remedial actions. The remedy selected in this Plan is, to the extent possible, in accordance with the Federal National Oil and Hazardous Substances Contingency Plan (NCP), 40 C.F.R., Part 300

The information supporting this remedial action decision is contained in the record repositories for this site. This Remedial Action Plan contains a Decision Declaration and a Decision Summary.

2. SITE DESCRIPTION

The MSLA 1D Landfill is located near Exit 15 W of the NJ Turnpike, at 1500 Harrison Avenue, in the Town of Kearny, Hudson County (Figure 1). It is situated primarily on a 93.8 acre tract of land designated as Block 285, Lot 2, which is owned by the Town of Kearny (Figure 2).

The MSLA 1D Landfill lies within an area classified as the Hackensack Meadowlands District. Within the District are over 400 acres of wetlands that provide valuable habitat for a wide variety of fish and wildlife species. They also provide for flood control, filtering of pollution, recreation, and educational opportunities. Development within the District is governed by the Hackensack Meadowlands Reclamation and Development Act. The Hackensack Meadowlands Development Commission (HMDC) has planning and zoning authority within the District to the end of promoting a balance between economic growth and the environment. The landfill property is currently zoned SU-3, Special Use. SU zoning is designed to accommodate special uses of regional importance.

The landfill property is triangular in shape. It is vacant except for a landfill gas recovery and processing facility operated by GSF Energy, Inc, a Division of the EcoGas Corporation. The landfill is boarded on the east by wetlands, a TRANSCO gas pipeline easement, and the NJ

Turnpike Passaic River Viaduct. To the south are PSE&G and TRANSCO gas pipelines and a wetland that is connected to the Passaic River by culverts under NJ Transit Rail Lines. Wetlands and a NJ Department of Transportation right-of way bound the northwest side of the triangular lot. On the west side, the adjacent property is being used for storage of heavy and construction equipment.

Dark-colored, odorous leachate can be observed flowing from seeps in the landfill into adjacent wetlands on the south and east sides. On the north side, leachate seeps discharge along the curbline of Harrison Avenue. The flow of leachate out of the landfill is estimated to be several hundred thousand gallons per day. Leachate contaminated water in the wetlands is free to flow through a culvert on the south side of the site into the Passaic River which flows into the Newark Bay. The distance from the Passaic River to the site is less than 1000 feet.

GSF Energy, Inc. operates a number of gas extraction wells on top of the landfill. Gas is piped from the wells to their plant at the toe of the landfill, processed, mixed with gas extracted from other nearby landfills, and then conveyed along the eastern side of the landfill to a connection with a Public Service Gas and Electric Company Pipeline.

Subsurface conditions at the site can be described in terms of six strata. The refuse fill material rises some 110 feet above the surrounding land. Under the refuse is a thin stratum of organic peat which is considered to represent the original wetland soils. Based on soil boring information, the organic peat is underlain by a gray sand stratum which is 20 to 30 feet thick. Below this is a stratum of finely-layered (varved) sand and silt, approximately 25 feet thick, which is underlain by a stratum of clayey silt, sand and gravel, approximately 20 feet thick. Underlying the overburden soils is red brown shale bedrock (e.g. the Brunswick Formation).

Presently, ground water usage in the area is limited to industrial purposes. All municipalities within 3 miles of the site draw their drinking water from the Wanaque Reservoir, located in northern Passaic County, or from other reservoirs. There are nine industrial wells within 3 miles of the site, the nearest being approximately 0.8 mile southwest. This later well withdraws water from the stratum overlying the bedrock. Seven other wells within a 3-mile radius of the site draw water from the Brunswick Formation. Reported yields of these wells are as much as 600 gallons per minute (gpm), and the median yield is reported to be 100 gpm.

3. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A 1955 topographic map and aerial photographs from 1961-1962 of the area around the site show it to be primarily wetlands. A 1971 aerial photograph shows landfilling of construction and demolition debris in the southwestern portion and sanitary waste in the northeastern portion of the site. Portions of the site have been filled to accommodate connections between Route I-280 and Harrison Avenue. In the 1970s, the landfill property was leased by the Town of Kearny, who owned the land, to the Municipal Sanitary Landfill Authority (MSLA). In 1977, the MSLA obtained Certificate of Registration No. 0907C from the NJDEP allowing the site to be used for landfilling. By 1978, aerial photographs show that the majority of wetlands had been filled. It is documented that more than 4 million tons of solid waste were disposed at the landfill between 1977 and 1979, at which time it was closed. A significant volume of waste oil, estimated at approximately 1.5 million gallons, was also disposed of in the landfill. In addition, a variety of industrial-type wastes were reportedly disposed of and are listed as follows:

Sludge Waste (unknown content)	Wet Gas Scrubber Sludge	Dredge Material
Pharmaceuticals	Filter Cake (lime-based)	Insecticides
Plastic Resins (solid)	Asphaltic Bottoms	Deodorants
Activated Charcoal Sludge	Filter Cake (sewer sludge)	Wax (solid)
Construction Debris	Fuel Oil	

The landfill was reopened again between 1981 and 1982, but was never properly closed. The final cover was insufficient and the leachate collection and monitoring systems were not operating. Throughout its operation of the landfill, the MSLA was cited with various violations. Under administrative order from the NJDEP the landfill ceased operations in 1982 due in part to the fact that it had reached its maximum allowable height and that the MSLA had failed to maintain the leachate collection system.

Since the end of the 1980s up to the present, GSF Energy, Inc has operated a landfill gas extraction and processing facility at the site. In addition to processing gas from the 1D Landfill, gas is extracted and piped to the facility from two other MSLA Landfills nearby. Once processed, the gas is piped along the eastern side of the landfill and into a PSE&G pipeline line in the southeastern corner of the site.

There have been a number of problems at the landfill since it ceased operations 1982. In 1987, a NJDEP site inspection observed large, open cracks in the top of the landfill. There was immediate concern that a possible slope failure was underway. Monitoring and slope stability analyses by the State, PSE&G and the New Jersey Turnpike Authority lead all to conclude that the landfill was stable and surface cracks were due to internal settlement. Later, in 1995, a fire developed at the site covering a 10 to 20 acre area. The Town of Kearny estimated their cost to extinguish the fires at up to $500,000 and requested State aid from the Governor. Vegetation at the site is not mowed or maintained and the potential for fires is always present.

In 1986, the USEPA's contractor, Malcolm Pirnie, Inc, performed a Preliminary Assessment of the site. The Report recommended a site inspection to assess the quality of the leachate. In 1990 the USEPA's contractor, NUS Corporation, performed sampling and investigations and issued a Site Investigation Report. The findings of this Report are summarized in Section 5 of this Remedial Action Plan.

Berms are present along the toe of the landfill on all sides. Apparently, these were constructed by MSLA to contain leachate seepage out of the landfill. Leachate would pond behind the berms and then be pumped up onto the landfill or discharged into wetlands flowing into the Passaic River. Since the MSLA ceased operations at the landfill, the leachate overflows the berms into the adjacent wetlands.

Due to lack of a viable party at this time to undertake the proper closure measures, the NJDEP is proceeding to perform the work described in this Remedial Action Plan using public funds.

4. PUBLIC NOTICE

The NJDEP has provided public notice in the Jersey Journal newspaper of its intent to remediate the site. A toll-free telephone number and mailing address is provided for questions and further information.

The selection of the remedy in this Plan is based on three key documents: (1) "Potential Hazardous Waste Site Preliminary Assessment", dated May 22, 1986, by Malcolm Pirnie, Inc; (2) "Final Draft Site Inspection Report", dated June 29, 1990, by the NUS Corporation, which provides background information and the results of sampling at the site; and (3) "Background Investigation and Design Recommendation Report", dated July 1999, by Louis Berger and Associates, Inc, which also provides background information and describes the remedial measures to be implemented. These documents, and other site-related information, can be found at the following location:

New Jersey Department of Environmental Protection
P.O. Box 413,
401 East State Street
Trenton, New Jersey 08625-0413
Contact: Ms. Mindy Mumford, Community Relations Coordinator
Bureau of Community Relations
Phone: 1-800-253-5647

The NJDEP has also established information repositories that contain the most important site-related documents at the following locations:

Kearny Public Library
318 Kearny Avenue
Kearny, NJ
Contact Nancy Smith, Reference Librarian
201-998-2666

Hackensack Meadowlands Development Commission
One DeKorte Park Plaza
Lyndhurst, NJ
Contact Mr. Thomas R. Martarano, Director of Solid Waste and Engineering
201-460-1700

The NJDEP encourages the public to review these documents in order to gain a more comprehensive understanding of the site, the activities that have been conducted, and the basis for the remedy selected herein.

5. SITE CONTAMINATION

Information about the nature and extent of contamination at the site can be found in the "Final Draft Site Inspection Report", dated June 29, 1990, by the NUS Corporation (NUS). NUS personnel collected ground water, surface soil, surface water, sediment, and leachate samples for the US Environmental Protection Agency. Samples were analyzed for priority pollutant organic chemicals and metals.

The Sample Location Map is included as Figure 3. Sampling results from the NUS Report are presented in Tables 1 through 5 and are compared to NJDEP standards.

5.1 GROUND WATER

The aquifers underlying the site are classified as Class II-A in the New Jersey Ground Water Quality Standards (GWQS), N.J.A.C. 7:9-6. Class II-A ground water aquifers are designated as suitable for potable water supply. Hazardous organic and inorganic compounds were detected in the ground water at the site at concentrations above Class II-A GWQS as shown in Table 1.

One ground water sample was obtained from an existing well (Well No. MW-3 in the NUS Report) installed in the shallow, overburden aquifer on the west side of the site. Two volatile organic compounds were detected above GWQS as follows: chlorobenzene at 58 parts per billion (ppb) and total xylenes at 1,100 ppb. Inorganic analyses also detected aluminum, barium, chromium, iron, lead, manganese, nickel, and sodium at levels exceeding GWQS.

The depth to ground water at the site is relatively shallow. Water levels in on-site monitoring wells installed along the base of the landfill ranged from 2.5 to 9 feet below ground surface during the NUS sampling events. This shallow, unconsolidated aquifer is composed of recent organic sediments at the top and glacially deposited material with depth. The shale bedrock aquifer begins approximately 70 feet beneath the ground surface. Although the primary permeability of the shale is low, appreciable amounts of water are found in joints and fractures. The shallow ground water flow direction at the site is radially outward due to the large mound of leachate in the landfill. Shallow ground water discharges locally into adjacent wetlands and surface water bodies. There is no evidence that the landfill was constructed with a bottom liner, therefore, leachate is free to drain out of the waste materials and directly into ground water.

5.2 LANDFILL LEACHATE

Five samples were taken from leachate ponds or seeps along the toe of the landfill. Sample analytical results are presented in Table 2 and compared to New Jersey Surface Water Quality Criteria (SWQC), N.J.A.C. 7:9-4 et seq for Saline Estuary, SE-type waters. Levels of polynuclear aromatic hydrocarbons (ie. pyrene, flouranthene, benzo(a)anthracene, chrysene, benzo(b)flouranthene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene) were detected at levels above SWQC which are protective of human health. The pesticides beta-BHC, 4-4'-DDD, 4-4'-

DDE, and 4-4'-DDT were all detected in leachate at levels above SWQC which are protective of human health. Analyses for inorganic compounds also detected metals at levels exceeding SWQC for protection of human health or aquatic life including: arsenic at 7.3 ppb, lead at 1250 ppb to 1,250 ppb, zinc at 2360 ppb, chromium at 262 ppb, copper at 490 ppb, and mercury at 2.6 ppb (concentrations are qualified as estimated).

5.3 SURFACE WATERS AND SEDIMENTS

The Passaic River in the vicinity of the site is classified as Saline Estuary (SE) in the New Jersey Surface Water Quality Standards (SWQS), N.J.A.C. 7:9-4 et seq. SE-type waters are designated for the maintenance and migration of fish populations, the migration of diadromous fish, secondary contact recreation, the maintenance of wildlife, and any other reasonable uses.

Only one surface water sample was taken from the wetland on the northeast side of the landfill. Sample analytical results are presented in Table 3. Benzene and chlorobenzene were the only organic contaminants detected, both at concentrations of 3 ppb. Inorganic contaminants were also detected. Arsenic and mercury were detected at levels exceeding saltwater SWQS for the protection of human health. The following metals were also detected at concentrations exceeding saltwater SWQC for the protection of aquatic life: copper at an estimated 1,500 ppb; lead at 1,050 ppb; mercury at an estimated 2.0 ppb; nickel at an estimated 222 ppb; and zinc at an estimated 1,070 ppb.

Sediment samples were taken from two locations as shown in Figure 3. Sample analytical results are presented in Table 4. No promulgated standards exist for sediment quality. Sediment results were compared to published criteria in the "Guidance For Sediment Quality Evaluations", NJDEP, dated November 1998. A sediment sample taken in the wetland northeast of the landfill detected the following semi-volatile organic compounds at levels above "Low Effects Range" screening level where adverse benthic impacts have been observed in 10% of the studies: fluoranthene at 1,700 ppb; pyrene at an estimated 2,400 ppb; benzo(a)anthracene at 1,600 ppb; chrysene at 2,000 ppb; benzo(a)pyrene at 2,200 ppb; indeno(1,2,3-cd)pyrene at 1,800 ppb; and benzo(g,h,i)perylene at 1,600 ppb. Also detected above the sediment screening criteria was the following pesticide 4,4'-DDT at an estimated 67 ppb. Inorganic analyses also detected arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc above NJDEP sediment screening criteria.

5.4 SOILS

Analytical results are available in the NUS Corporation's Site Inspection Report for five surface soil samples taken around the perimeter of the landfill. Table 5 lists the compounds detected and compares them to NJDEP Soil Cleanup Criteria (SCC). The SCC are guidelines used by the NJDEP to determine if remediation is necessary. The non-residential SSC and the SSC for protection of ground water are applicable to the site at the present time. The non-residential criteria were developed to be protective of human health based on an ingestion pathway. The ground water SSC were developed to protect the potability of the underlying aquifer from contaminants that might leach out of the soils.

Three volatile organic compounds were detected in the soils: chlorobenzene, ethylbenzene, and xylenes. Polyaromatic hydrocarbons (PAHs) were also detected, including benzo(a)pyrene at 750 ppb, which exceeds the SSC for non-residential direct contact. Pesticides were detected including: beta-BHC; 4,4'-DDT, methoxychlor, and 4,4'-DDE. Metals were detected in soil samples including: arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

In addition to chemical compounds detected in the soils, previous site investigations have observed wastes on the surface of the site. These include medical wastes, chemical drums, and large tanks.

5.5 Air

Gaseous emissions from the landfill are controlled to some degree by the gas extraction system in operation on top of the landfill. During site visits by NJDEP personnel in 1999, foul odors were noted in areas where leachate is seeping from the side of the landfill or where it is ponded.

6. SUMMARY OF SITE RISKS

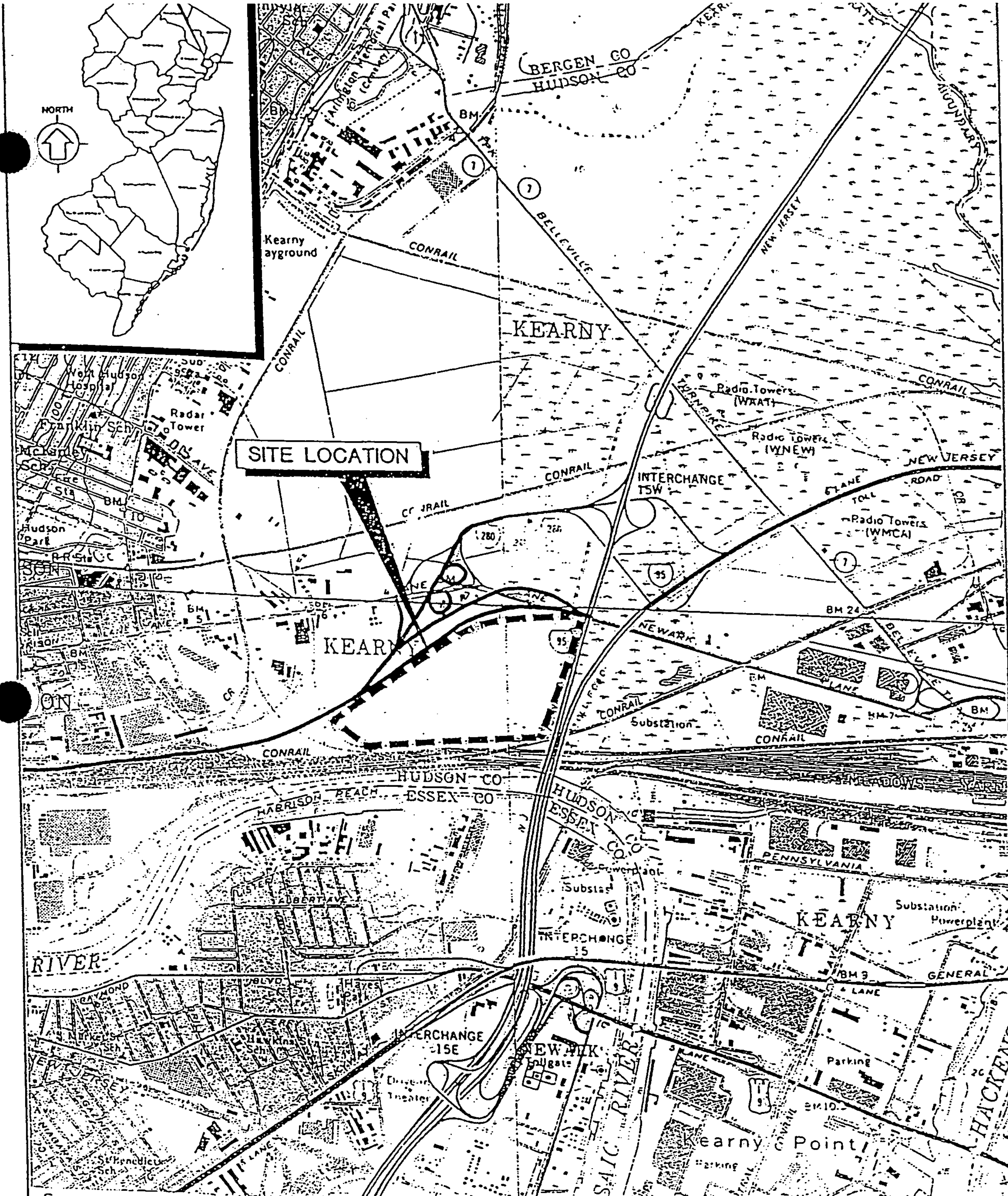
The remedy selection rationale in this Remedial Action Plan follows the Presumptive Remedy approach presented in the USEPA Directive No. 9355.0-49FS, entitled "Presumptive Remedy for CERCLA Municipal Landfill Sites." This streamlined approach, as used herein for municipal landfills, consists of identifying chemicals present in ground water, sediments, and surface water, and comparing them to standards for those media which may be applicable or relevant and appropriate requirements (ARARs). Those chemicals that exceeded ARARs for a given pathway are considered to require remedial action. A detailed calculation of risk factors to human health or the environment was not performed. Under the Presumptive Remedy approach, any contaminant exceeding a chemical-specific ARAR is assumed to result in a site risk.

Tables 1-5 compare the levels of contaminants detected in ground water, leachate, surface water, sediments, and soils with State ARARs. As shown, the ground water quality at the site is contaminated above levels determined to be protective of human health based on potable use. Surface water and sediments in the wetlands are also degraded by landfill leachate above standards established for the protection of human health and/or aquatic life. Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Remedial Action Plan, may present an imminent and substantial endangerment to public health, welfare, or the environment.

7. REMEDIAL ACTION SELECTION

This Remedial Action Plan was developed with the goal of attaining the following objectives for on-site contamination:

ATTACHMENT I – FIGURES



Source: USGS 7.5 Min. Quodrangle, Orange, N.J.

Scale: 1" = 2000'

N.J. Department of Environmental Protection	MSLA-1D LANDFILL, KEARNY, NEW JERSEY SITE LOCATION MAP NJDEP CONTRACT No. A-85149	Louis Berger & Assoc. 30 Vreeland Road Florhom Park, NJ	FIGURE 1

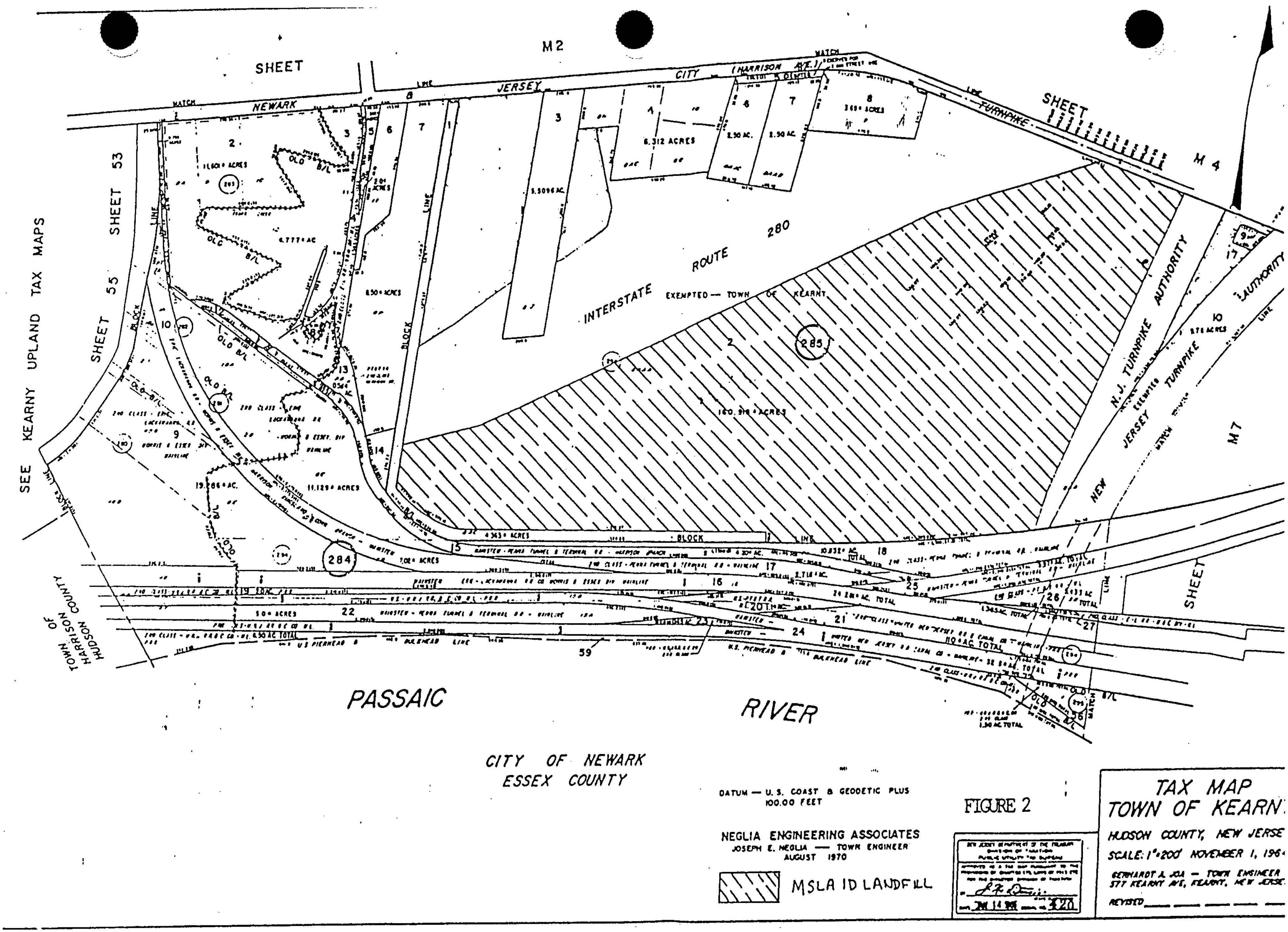

M2
SHEET
NEWARK
JERSEY
CITY
(HARRISON AVE.)
TURNPIKE
SHEET
M 4
SEE KEARNY UPLAND TAX MAPS
SHEET 53
SHEET 55
INTERSTATE ROUTE 280
EXEMPTED — TOWN OF KEARNY
N.J. TURNPIKE AUTHORITY
NEW JERSEY TURNPIKE AUTHORITY
M7
SHEET
160.918± ACRES
6.312 ACRES
19.206± AC.
11.129± ACRES
284
285
TOWN OF HARRISON HUDSON COUNTY
PASSAIC
RIVER
CITY OF NEWARK
ESSEX COUNTY
DATUM — U. S. COAST & GEODETIC PLUS 100.00 FEET
NEGLIA ENGINEERING ASSOCIATES
JOSEPH E. NEGLIA — TOWN ENGINEER
AUGUST 1970
MSLA ID LANDFILL
TAX MAP
TOWN OF KEARN
HUDSON COUNTY, NEW JERSE
SCALE: 1"=200' NOVEMBER 1, 196
GERHARDT A. JOA — TOWN ENGINEER
577 KEARNY AVE, KEARNY, NEW JERSE
REVISED

FIGURE 2

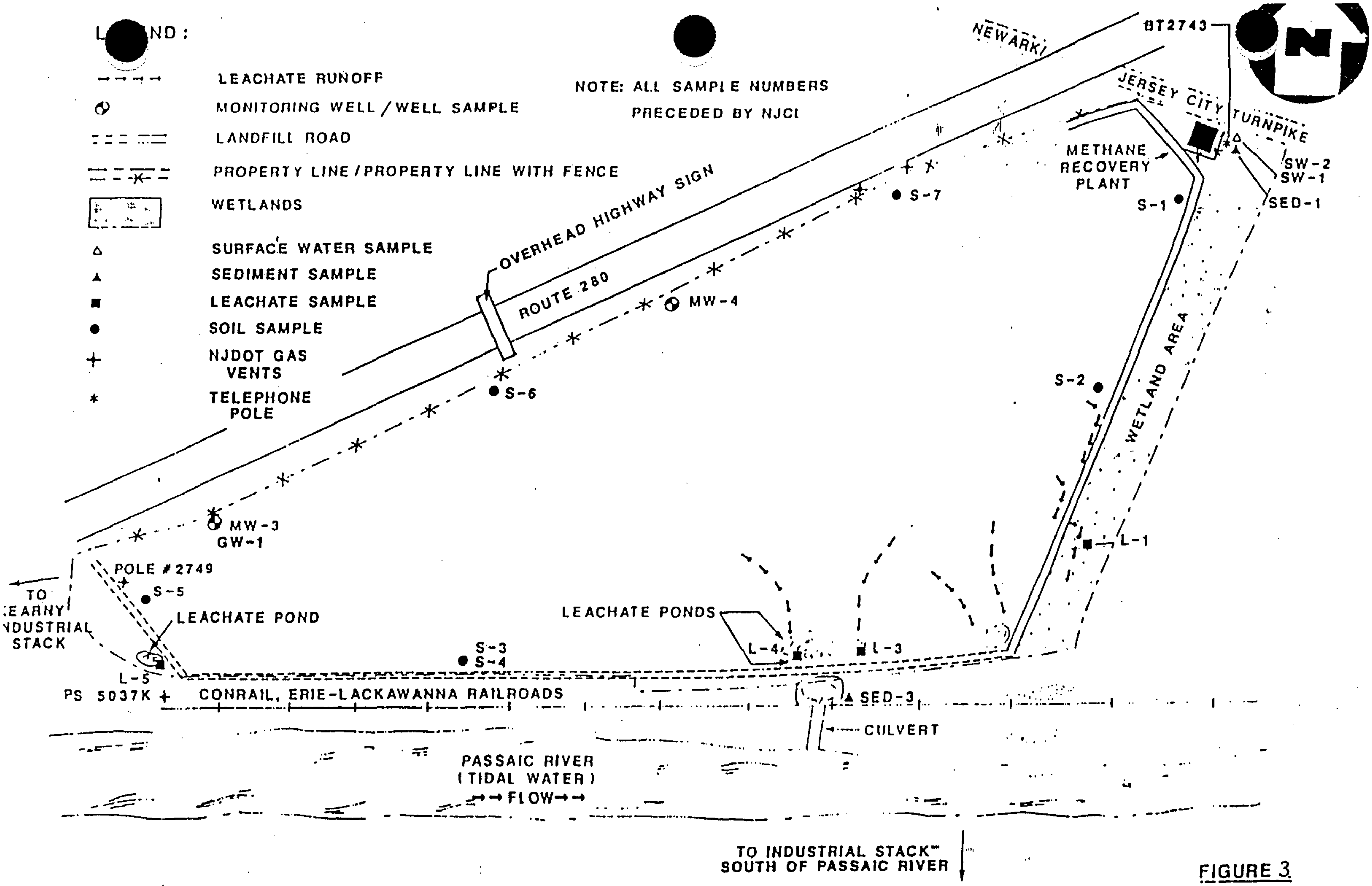


FIGURE 3

NUS CORPORATION

SAMPLE LOCATION MAP

MSLA, 1-D LF, KEARNY, N.J.

(SCALE UNKNOWN)

ATTACHMENT II - TABLES

TABLE 1
MSLA 1-D LANDFILL
SITE INSPECTION SAMPLING RESULTS-GROUND WATER *

QUANTIFIED COMPOUNDS (ug/L)	SAMPLE IDENTIFICATION NJCL-GW1	NJDEP CLASS IIA GWQS (ug/L)**
VOLATILE ORGANIC COMPOUNDS		
Chlorobenzene	58	4
Ethylbenzene	50	700
Toluene	24J	1000
Xylenes (Total)	1,100	40
SEMI-VOLATILE ORGANIC COMPOUNDS	ND	
PESTICIDES/PCBS	ND	
METALS		
Aluminum	1720 E	200
Arsenic	6.9J	8
Barium	3310 E	2000
Calcium	61,000 E	NP
Chromium	101 E	100
Cobalt	3.4J	NP
Copper	61.1 E	1000
Iron	92,900 E	300
Lead	317 E	10
Magnesium	92,000 E	NP
Manganese	221 E	50
Nickel	143 E	100
Potassium	505,000 E	NP
Sodium	244,000 E	50,000
Vanadium	20.6J	NP
Zinc	331 E	5000

NOTES:
* Sampling performed by NUS Corporation and analyses performed by Keystone Environmental, 1/90.
** GWQS Ground Water Quality Standards (N.J.A.C. 7:9-6)

ug/L - micrograms per liter
J - Estimated value for compound present below CRDL but above IDL
E - Estimated value
NP - Not published for this constituent

TABLE 2
MSLA 1-D LANDFILL
SITE INSPECTION SAMPLING RESULTS - LEACHATE*

QUANTIFIED COMPOUNDS (ug/L)	SAMPLE IDENTIFICATION				SWQC HUMAN HEALTH (ug/L)**	SWQC AQUATIC LIFE (ug/L)***
	NJCL-L1	NJCL-L3	NJCL-L4	NJCL-L5		
VOLATILE ORGANIC COMOUNDS						
2-Hexanone	25E	ND	ND	ND	NP	NP
SEMIVOLATILE ORGANIC COMPOUNDS						
Phenanthrene *	540J	250J	300J	780J	NP	NP
Flouranthene *	860J	380J	440J	820J	370	NP
Pyrene *	1,100E	1,100E	760E	800J	8,970	NP
Benzo(a)anthracene *	460J	370J	350J	380J	0.031	NP
Chrysene *	650J	450J	420J	420J	0.031	NP
Benzo(b)Fluoranthene *	1,100	660J	730J	570J	0.031	NP
Benzo(a)pyrene *	550J	540J	440J	ND	0.031	NP
Indeno(1,2,3-cd)pyrene *	440J	310J	280J	ND	0.031	NP
Benzo(g,h,i)perylene *	430J	420J	330J	ND	NP	NP
PESTICIDES/PCBS						
beta-BHC *	31J	ND	ND	ND	0.460	NP
4,4'-DDD *	24J	ND	35J	7.1J	0.000837	NP
4,4'-DDE *	ND	ND	24J	27J	0.000590	NP
4,4'-DDT *	7.1J	ND	39J	1.1J	0.000590	NP
Methoxychlor *	ND	ND	47J	ND	NP	0.03
METALS						
Aluminum	12,200 E	9,310 E	6,430 E	9,980 E	NP	NP
Antimony	ND	8.20J	6.40J	14.5	4,300	NP
Arsenic	4.8	ND	5.4	7.3	0.136	36
Barium	559 E	280 E	330 E	215 E	NP	NP
Beryllium	0.47J	0.71J	0.25J	2	NP	NP
Cadmium	0.76J	2.1	0.98J	3.9	NP	9.3
Calcium	24,100 E	13,600 E	12,600 E	10,600 E	NP	NP
Chromium *	20 E	103 E	262 E	68.1 E	3,230	50 a
Cobalt	6.20J	8.30J	21.5	6.70J	NP	NP
Copper	37.4 E	91.8 E	113 E	490 E	NP	5.6 b
Iron	17,500 E	27,500 E	29,500 E	16,500 E	NP	NP
Lead *	304 E	503 E	248 E	1250 E	NP	8.1
Magnesium	6,010 E	3,290 E	4,100 E	3,690 E	NP	NP
Mercury *	0.41 E	0.39 E	0.35 E	2.6 E	0.146	0.025 b
Nickel *	25.8	175	427	75.1	3,900	8.2
Potassium	1,530	720J	573J	1,450	NP	NP
Vanadium	34.9	30.7	33.5	26.5	NP	NP
Zinc	384 E	450 E	223 E	2,360 E	NP	81

NOTES:
* Sampling performed by NUS Corporation and analyses performed by Keystone Environmental, January 1990.
** SWQC Surface Water Quality Criteria - Saltwater, Human health criteria, total recoverable NJAC 7:9B-1.14
*** SWQC Surface Water Quality Criteria - Saltwater, Chronic effects aquatic life criteria, dissolved
a - Chronic effects for Cr^{+6}
b - Total recoverable

ug/L - micrograms per liter
J - Estimated value for compound present below CRDL but above IDL
E - Estimated value
ND - Not Detected

* exceed GWQC

TABLE 3
MSLA 1-D LANDFILL
SITE INSPECTION SAMPLING RESULTS - SURFACE WATER *

QUANTIFIED COMPOUNDS (ug/L)	SAMPLE IDENTIFICATION NJCL-SW2	NJDEP HUMAN HEALTH SWQC (ug/L)**	NJDEP AQUATIC SWQC (ug/L)***
VOLATILE ORGANIC COMPOUNDS			
Benzene	3J	71	NP
Chlorobenzene	3J	21,000	NP
SEMI-VOLATILE ORGANIC COMPOUNDS	ND		
PESTICIDES/PCBS	ND		
METALS			
Aluminum	25,100E	NP	NP
Arsenic	22.9E	0.136	36
Barium	1240	NP	NP
Cadmium	6.9	NP	9.3
Calcium	233,000E	NP	NP
Chromium	292E	3,230	50 a
Cobalt	30.4J	NP	NP
Copper	1,550E	NP	5.6 b
Iron	60,800E	NP	NP
Lead	1,050E	NP	8.1
Magnesium	108,000E	NP	NP
Manganese	1,710E	100	NP
Mercury	2.0E	0.146	0.025 b
Nickel	222E	3,900	8.2
Potassium	159,000	NP	NP
Sodium	631,000	NP	NP
Vanadium	100E	NP	NP
Zinc	1,070E	NP	81

NOTES:
* Sampling performed by NUS Corporation and analyses performed by Keystone Environmental, 1/90.
** SWQC Surface Water Quality Criteria - Saltwater, Human health criteria, total recoverable NJAC 7:9B-1.14
*** SWQC Surface Water Quality Criteria - Saltwater, Chronic effects aquatic life criteria, dissolved
a - Chronic effects for Cr^{+6}
b - Total recoverable

ug/L - micrograms per liter
J - Estimated value for compound present below CRDL but above IDL
E - Estimated value
NP - Not published for this constituent
ND - Not Detected

TABLE 4
MSLA 1-D LANDFILL
SITE INSPECTION SAMPLING RESULTS-SEDIMENTS*

QUANTIFIED COMPOUNDS (mg/kg)	SAMPLE IDENTIFICATION		MARINE/ESTUARINE SEDIMENT CRITERIA**	
	NJCL-SED1	NJCL-SED3	Low Effects Level (mg/kg)	Medium Effects Level (mg/kg)
VOLATILE ORGANIC COMPOUNDS				
2-Butanone	0.053	0.095	NP	NP
2-Hexanone	0.014J	ND	NP	NP
SEMI-VOLATILE ORGANIC COMPOUNDS				
Phenanthrene	0.670J	ND	0.240	1.50
Flouranthene	1.70	0.64J	0.600	5.10
Pyrene	2.40E	0.81J	0.665	2.60
Benzo(a)anthracene	1.60	0.68J	0.261	1.60
Chrysene	2.00	0.93J	0.384	2.80
Benzo(b)Fluoranthene	4.50	1.40J	NP	NP
Benzo(a)pyrene	2.20	0.82J	0.430	1.60
Indeno(1,2,3-cd)pyrene	1.80	0.78J	0.200	320.00
Benzo(g,h,i)perylene	1.60	0.75J	0.17	320.00
Total Polynuclear Aromatic Hydrocarbons	18.47J	6.81J	4.0	45.0
PESTICIDES/PCBS				
beta-BHC	0.022J	[illegible]	0.005	21
4,4'-DDD	0.015J	0.180 E	NP	NP
4,4'-DDE	0.035J	ND	0.0022	0.027
4,4'-DDT	ND	0.067J	0.0016	0.0460
METALS				
Aluminum	10,600 E	12,000 E	NP	NP
Arsenic	11.5	5.32	8.2	70.0
Barium	180 E	228 E	NP	NP
Cadmium	3.7	ND	1.2	9.6
Calcium	5,020 E	13,000 E	NP	NP
Chromium	181 E	50.1 E	81.0	370.0
Copper	947 E	85.9 E	34.0	270.0
Iron	19,300 E	16,500 E	NP	NP
Lead	353 E	238 E	47.0	218.0
Magnesium	2,980 E	3,270 E	NP	NP
Mercury	2.01 E	0.82 E	0.15	0.71
Nickel	68	24.4	21.0	52.0
Sodium	1310J	1,660	NP	NP
Vanadium	34	33.7	NP	NP
Zinc	360 E	299 E	150.0	410.0

NOTES:

* Sampling performed by NUS Corporation and analyses performed by Keystone Environmental, January 1990.

** NJDEP Guidance For Sediment Quality Evaluations, November 1998

mg/kg - milligrams per kilogram
J - Estimated value for compound present below CRDL but above IDL
E - Estimated value
NP - Not published for this constituent
ND - Not Detected

TABLE 5
MSLA 1-D LANDFILL
SITE INSPECTION SAMPLING RESULTS-SOIL*

QUANTIFIED COMPOUNDS (mg/kg)	SAMPLE IDENTIFICATION				NJDEP NRDCSCC** (mg/kg)	NJDEP RDCSCC*** (mg/kg)	NJDEP IGWSCC**** (mg/kg)
	NJCL-S1	NJCL-S3	NJCL-S6	NJCL-S7			
VOLATILE ORGANIC COMPOUNDS							
Chlorobenzene	ND	ND	ND	0.150	680	37	1
Ethylbenzene	ND	ND	ND	0.081	1,000	1,000	100
Xylenes (Total)	ND	ND	ND	0.069	1,000	410	67
SEMI-VOLATILES ORGANIC COMPOUNDS							
Phenanthrene	ND	ND	ND	1.20	NP	NP	NP
Fluoranthene	0.150J	ND	ND	1.90	10,000	2,300	100
Pyrene	0.170J	0.93	ND	2.20	10,000	1,700	100
Benzo(b)fluoranthene	0.170J	ND	ND	1.40	4	0.9	50
Benzo(a)pyrene	ND	ND	ND	0.75E	0.66	0.66	100
Benzo(a)anthracene	ND	ND	ND	0.91J	4	0.9	500
Indeno(1,2,3-cd)pyrene	ND	ND	ND	0.39E	4	0.9	500
PESTICIDES/PCBS							
Beta-BHC	0.015	ND	0.078E	0.100	NP	NP	NP
4,4'-DDT	0.0027J	0.100	ND	ND	9	2	500
Methoxychlor	0.040J	0.030J	0.200J	ND	5,200	280	50
4,4-DDE	ND	0.051J	ND	ND	9	2	50
METALS							
Aluminum	5,660 E	7,840E	8,240 E	13,000 E	NP	NP	NP
Arsenic	2	4.1	6.1	6.7	20	20	(Site Specific)
Barium	26.4J	157 E	78.9 E	193	47,000	700	(Site Specific)
Cadmium	0.74J	1.1	1.6	1.0J	100	39	(Site Specific)
Chromium	11.4	60.8	85.2 E	34 E	(Site Specific) *	120,000 *	NP
Copper	37.3 E	56.9 E	59.1 E	137 E	600	600	(Site Specific)
Lead	40.8	216 E	71.4 E	200 E	600	400	(Site Specific)
Mercury	ND	0.36 E	1 E	0.82 E	270	14	(Site Specific)
Nickel	ND	120	17.7	18.8	2,400	250	(Site Specific)
Vanadium	12.2	27.5	22.6	18.7	7,100	370	(Site Specific)
Zinc	26.3 E	206 E	132 E	211 E	1,500	1,500	(Site Specific)

NOTES:
* Sampling performed by NUS Corporation and analyses performed by Keystone Environmental, January 1990.
** NRDCSCC Non-Residential Direct Contact Soil Cleanup Criteria (Last Revised-5/3/99)
*** RDCSCC Residential Direct Contact Soil Cleanup Criteria (Last Revised-5/3/99)
**** IGWSCC Impact to Ground Water Soil Cleanup Criteria (Last Revised-5/3/99)
* Trivalent Chromium

mg/kg - milligrams per kilogram
J - Estimated value for compound present below CRDL but above IDL
NP - Not published for this constituent
ND - Not Detected
E-Estimated value

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ENGINEERS • PLANNERS • SCIENTISTS • ECONOMISTS • ARCHAEOLOGISTS

A MEMBER OF THE BERGER GROUP

May 11, 1999

Mr. Michael Burlingame, Case Manager
New Jersey Department of Environmental Protection
Division of Publicly Funded Site Remediation
Bureau of Site Management
401 East State Street, CN 413
Trenton, NJ 08625

RE: Draft Background Investigation and Remedial Design Recommendations Report
MSLA 1-D Landfill, Kearny, NJ
Term Contract for Remedial Investigation/Remedial Alternatives
Contract No. A-85149

Dear Mr. Burlingame:

Enclosed are six (6) copies of the Draft BIDR Report for the MSLA 1-D Landfill for the Department's review. Should you have any questions or comments regarding this submittal, please contact me via e-mail at tlewis@louisberger.com, or by phone at (973) 678-1960, Ext. 755.

Sincerely,

LOUIS BERGER & ASSOCIATES, INC.

Thomas G. Lewis, P.E., J.D.
Program Manager

cc: R. Collier (NJDEP)
M. Rodrigo, R. Harding, C. Duerr (Berger)

Enclosures (6)

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1.0 INTRODUCTION

1.0 INTRODUCTION

Louis Berger and Associates (Berger) has been contracted by the New Jersey Department of Environmental Protection (NJDEP) to perform site-specific Remedial Investigations (RI) and Remedial Alternatives Analyses (RAA) for select sites throughout New Jersey. The MSLA 1-D Landfill site (EPA ID No. NJ981877673), located in the Town of Kearny, Hudson County, is one of the sites to be investigated under this contract (See Figure 1). This chapter will provide discussions on the RI/RAA project scope and staffing, an overview of the site's history, and descriptions of Berger's recent site inspection and file review.

1.1 Project Scope and Staffing

Based on the findings from a comprehensive file review, the results of previous investigations and in situ site inspections by Berger personnel, the BIDR summarizes information on the site's ownership, operating history, physical and environmental setting and status, nature and extent of site related contamination, and preliminary feasibility of selected remedial alternatives needed for site closure. Developed as the initial phase of site remedial investigations, the BIDR identifies existing data gaps to be considered in planning and performance of subsequent RI/RAA tasks including development of a Site Sampling and Investigation Plan (SSIP). The report evaluates measures needed for site closure and recommend cost effective remedial design options which will have the least human, ecological and environmental impacts. In order to procure a contractor for the remedial design of closure plans for the MSLA 1-D site, NJDEP must first develop cost proposals and obtain bids for that remedial design. To this end, the purpose and intent of this Background Investigation and Design Recommendation Report (BIDR) is to identify current site conditions, identify data gaps to be filled by the remedial investigation, provide preliminary assessments of remedial technology alternatives, prepare preliminary cost estimates for each alternative, and provide recommendations for preferred remedial alternative selections based on site specific applicability and relative costs.

To conduct the planned remedial investigation of this site, Berger has assembled a project specific staff from the approved program staff list submitted to the NJDEP. Staffing of key personnel on this project is summarized as follows:

PROGRAM MANAGER	Level P-4	Thomas Lewis, P.E., Esq.
PROJECT MANAGER	Level P-4	Mahendra Rodrigo, P.E.
RI TASK LEADER	Level P-3	Craig Duerr, P.E.

1.2 Overview of Site History

The MSLA 1-D Landfill Site is a 93.8-acre tract of land in an industrial section of Kearny, Hudson County, New Jersey. The property is owned by the Town of Kearny, which had leased the land to the Municipal Sanitary Landfill Authority (MSLA) during the 1970s and 1980s. MSLA included four corporate entities: William A. Keegan Co., Inc.; Reclamation and Improvement Co., Inc.; Peter Roselle and Sons, Inc.; and Delaware Sanitation Co., Inc. The site was operated by MSLA as a regional landfill for the disposal of municipal and industrial wastes from the early 1970s until cessation of operations in 1982.

Wastes accepted for disposal at the site were believed to have been typical of the permitted materials as listed in the site's Certificate of Registration and Design as indicated by the NJDEP. Additionally, the landfill reportedly had accepted dry hazardous wastes, oil spill cleanup wastes, and pesticides. However, the disposal of these wastes at the site is not documented. A large pool of waste oil may also have been pumped onto the landfill during construction of U.S. Route 280 (NUS, 1990).

Multiple violation notices relating to the operation of the landfill, leachate control, and subsequent closure requirements have been issued since the start of landfill operations in 1971, culminating with the NJDEP's issuance of an administrative order to MSLA directing the cessation of operations effective September 22, 1982. Currently, the MSLA 1-D landfill site is inactive, except for a facility operated by Air Products for methane gas recovery (NUS, 1990).

Based on the results of limited sampling conducted during the NUS Corporation (NUS) Region 2 FIT Site Inspection in January of 1990, the media affected by wastes disposed on site are the soil, surface water, and groundwater. Laboratory analysis of the soil samples indicated the presence of several polyaromatic hydrocarbons (PAHs) and pesticides. Leachate analysis detected PAHs and concentrations of numerous inorganic compounds. Analytical results of the surface water and sediment samples indicated that PAHs, pesticides, and inorganic compounds similar to those in the soils and leachate samples were present. Groundwater analysis indicated that volatile organic compounds (VOCs) were present at that time (NUS, 1990).

More detailed discussions of the history and operations of the site is provided in Chapter 3 of this report. These discussions include a chronology of site operations, previous regulatory enforcement actions and remedial investigations, and anticipated future land uses.

1.3 Site Inspections

Berger conducted several site inspections to document observable site conditions such as: stressed vegetation; apparent discharges to air, soil, surface water and groundwater; storage, spill and disposal areas; contaminant migration pathways; and site accessibility for future investigations.

Following a project Kick-Off meeting held at Berger's Florham Park office on March 1, 1999, an initial site inspection was conducted by Berger and NJDEP personnel. Following the Landfill Remediation Plan of Action meeting held at HMDC's office on March 12, 1999, a second site inspection was conducted by Berger, NJDEP and HMDC personnel. A third site inspection was conducted by Berger and NJDEP personnel on March 31, 1999. The following observations were made during the site inspections. Photographs taken to document observations are included as Attachment 1.

Property Boundaries:
A chain link fence runs along the northwestern edge of the site. A gravel road runs along southern edge of the site. Leachate ponds were observed along the southern and eastern edges of the site.

Accessibility:
Due to uneven ground conditions, track mounted drill rigs may be necessary to conduct drilling work along the periphery of the site. The uneven, steep slopes along the southwestern edge of the site may present difficulties for drill rig access. Construction of temporary roads and ramps may be necessary prior to the implementation of a geotechnical drilling program.

Slopes:
Slopes along the landfill varied from 1:3 to 1:5. Steep slopes were observed along the northwest end of the site.

Utilities:
Markers for a Public Service Electric and Gas (PSE&G) natural gas line were observed along the service access road located at southern edge of the site. Markers for a Transco natural gas line were observed along the eastern edge of the site.

Leachate Seepage:
Leachate was observed seeping from the landfill into Harrison Avenue at the northeast end of the site. The leachate was draining along Harrison Avenue eastward.

Abandoned Wells/Piezometers:
Several abandoned monitoring wells and piezometers were observed along the toe of slope at the eastern and northern edges of the landfill.

Construction Equipment Salvage Yard:
A construction equipment salvage yard is situated at the southwest end of the site. Reportedly, the operator is not the owner of the property and has received multiple violations for filling wetlands. According to discussions at the Landfill Remediation Plan of Action meeting on March 12, 1999, the Deputy Attorney General will be proceeding with legal actions to remove the equipment yard operator and construction equipment from the property.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.0 NATURE AND EXTENT OF CONTAMINATION

This chapter provides an estimate, based on available information, of the current nature and extent of site related contamination. Suspected contaminant sources, types, pathways, affected media, and potential human and ecological receptors are presented in the following sections.

4.1 Contamination Sources, Types, Pathways and Affected Media

As part of the 1990 site inspection, six (6) surface soil samples, four (4) leachate samples, and one (1) groundwater sample were collected at the site to determine whether releases of contaminants to ground and surface waters attributable to the disposal activity have occurred (NUS, 1990). These samples were analyzed for TCL organic and inorganic parameters. The laboratory analysis of groundwater and surface soil samples indicated the presence of several volatile organic compounds (VOCs) (chlorobenzene, ethylbenzene, xylenes) in both media. In addition, pesticides and concentrations of inorganic compounds (lead, zinc, antimony, barium, chromium, cobalt, copper, and nickel) were found in the surface soil and leachate samples.

The apparent main source of contaminants found in groundwater, surface soil and leachate is the large quantity and variety of municipal and industrial wastes disposed at the MSLA 1-D landfill site in the 1970s and 1980s. Additional, isolated sources of contaminants may exist at the site, however, these individual sources cannot be identified and delineated without further investigation.

4.1.1 Surface Soil

Surface soil analytical data indicates polyaromatic hydrocarbons (PAHs) were detected at varied levels across the site (NUS,1990, Figure 2). The highest concentrations were detected in soil samples S-3, S-4, S-5, and S-7. PAH concentrations in these four samples were comparable however, the highest concentrations of PAHs found on site were detected in S-7. The compounds and the concentrations found in S-7 were as follows: phenanthrene 1,200 parts per billion (ppb), fluoranthene (1,900 ppb), pyrene (estimated 2,200 ppb), benzo (b) fluroanthene (1,400 ppb). Pesticides were detected in varied levels across the site. Soil samples S-1, S-6, and S-7 detected beta-BHC ranging in concentration from 15 to 100 ppb. Samples S-3 and S-4 detected 4,4'DDT in concentrations from 100 to an estimated 160 ppb. The compound 4,4,'-DDD was also found at an estimated 260 ppb in only S-4. Analysis of soil samples also detected volatile organic compounds (VOCs) present at the following concentrations in S-7: chlorobenzene (150 ppb), ethylbenzene (81 ppb), and xylenes (69 ppb).

4.1.2 Surface Water

Surface water analytical data indicates that no VOCs were detected above quantitation limits in the two surface water samples collected for analysis (SW-1 and its environmental duplicate SW-2)

(NUS,1990, Figure 2). However, there were two pesticides detected in SW-1 at the following concentrations: beta-BHC and endrin at 0.7 and 0.27 ppb, respectively.

4.1.3 Sediment

Sediment analytical data indicates only one VOC, 2 butanone, was present in SED-1 and SED-3 at concentrations of 53 and 95 ppm, respectively. Sediment sample SED-1 indicated levels of the following PAHs: fluoranthene (1,700 ppb), pyrene (estimated 2,400 ppb), benzo (a) anthracene (1,600 ppb), chrysene (2,000 ppb), benzo (b) fluoranthene (4,500 ppb), benzo (a) pyrene (2,200 ppb), indeno (1,2,3-cd) pyrene (1,800 ppb), and benzo (g,h,i) perylene (1,600 ppb). Pesticides were detected in SED-3 as follows: beta-BHC (estimated 2,000 ppb) and 4;4'-DDD (estimated 180 ppb). One inorganic compound, copper, was present in SED-1 at a concentration of 947 ppm (NUS,1990, Figure 2).

4.1.4 Leachate

Leachate analytical data indicates VOCs at varied levels present in leachate samples throughout the site. Only one VOC, 2-hexanone, was present in leachate sample L-1 at a concentration of 25 ppb. Pyrene was detected in leachate samples L-1, L-3, and L-4 ranging in concentration from an estimated 760 ppb to an estimated 1,100 ppb. In addition, sample L-1 contained PAHs such as fluoranthene (860 ppb) and benzo(b)fluoranthene (1,100 ppb).

Analysis for inorganic compounds in leachate samples indicated several compounds were detected. Leachate sample L-5 contained the following compounds: lead (1,250 ppb), zinc (2,360 ppb), antimony (14.5 ppb), and copper (490 ppb). Chromium (262 ppb), cobalt (21.5 ppb), and nickel (427 ppb) were detected in the analysis of leachate sample L-4. In addition, sample L-1 contained 559 ppb of the compound barium (NUS,1990, Figure 2).

4.1.5 Groundwater

Groundwater analytical data, indicated three VOCs present in groundwater sample GW-1. These compounds were chlorobenzene (58 ppb), ethylbenzene (50 ppb) and xylene (1,100 ppb). Inorganic analysis indicated concentrations of the following inorganics: barium (estimated 3,310 ppb) chromium (estimated 101 ppb), and lead (estimated 317 ppb) (NUS,1990, Figure 2).

Since no mention of a landfill liner was found in the background information, it is assumed that contaminants from the wastes disposed at the MSLA 1-D landfill site are currently uncontained. There is, therefore, potential for surface and groundwater contamination from the various compounds found in the previous laboratory analyses. As long as the landfill wastes remain uncontained, contamination within the original source area will continue to be released via leachate and surface runoff, and eventually migrate into nearby surface waters and the Passaic River.

4.2 Estimated Extent of Contamination

An estimated 4,111,070 tons of solid waste were disposed at the landfill between 1971 and 1979, and the total volume of oil pumped from the Active Oil Service site and deposited at the MSLA 1-D landfill site has been estimated at approximately 1.5 million gallons. Between 1979 and 1983, approximately 30 feet of additional fill material was placed on top of the oil waste (NUS, 1990). Sampling of the soil was conducted during the 1990 site inspection to determine the presence or lack of Target Compound List (TCL) inorganic or organic constituents attributable to the past dumping. Due to the limited quantity and distribution of samples collected during this previous investigation, the vertical and horizontal extent of contaminated soil, groundwater and leachate has never been fully delineated.

4.3 Human and Ecological Receptors

Approximately 5,000 people live within a 1 mile radius of the site (NUS, 1990). Public access is restricted only by fencing on the northwest along U.S. Route 280. Direct access can occur from both the east and west sides of the site, as there are dirt roads connecting with the on-site access road along the southern edge of the site. Therefore, the potential for direct contact with wastes on site and the leachate exists.

Based on the file review, potential hazardous conditions at the site have been identified as follows:

- Analyses of soil and leachate samples show above background contamination consisting of semi volatile and inorganic compounds.
- Medical wastes have been observed on the surface of the landfill.
- The public has access to the site. People were observed at or near the site during the on site reconnaissance and site inspection. The ongoing active operation of the on site methane recovery system requires workers to access all portions of the site for well drilling and observation of the piping system.

Contamination has not been documented either in organisms in a food chain leading to humans or in organisms directly consumed by humans. There have been no documented observed incidents of direct physical contact with hazardous substances at the site involving humans (not including occupational exposure) or domestic animals. There have been no documented incidents of damage to flora or fauna that can be attributed to the hazardous material at the site. There is no documented contamination of sanitary sewer or storm drains without a point source to which the contamination can be attributed. Based on field observations, there is no significant threat of fire or explosion.

Because the landfill is not presently contained, there is potential for contaminant migration to groundwater and surface waters through infiltration, percolation, runoff and leachate releases. Since all municipalities surrounding the area use remote sources as potable water supplies, the potential impact to potable water supplies is negligible. However, the potential exists for releases of contaminants in leachate to nearby wetlands and surface waters. The site is located within environmentally sensitive emergent wetlands. Contaminant releases to these wetlands could have potential impacts on ecological receptors. A full understanding of the groundwater flow, contaminant fate and transport, and the existence of any groundwater discharges will need to be investigated to determine if there any other potential threat to human and/or ecological receptors.

ATTACHMENT 1

SITE PHOTOGRAPHS

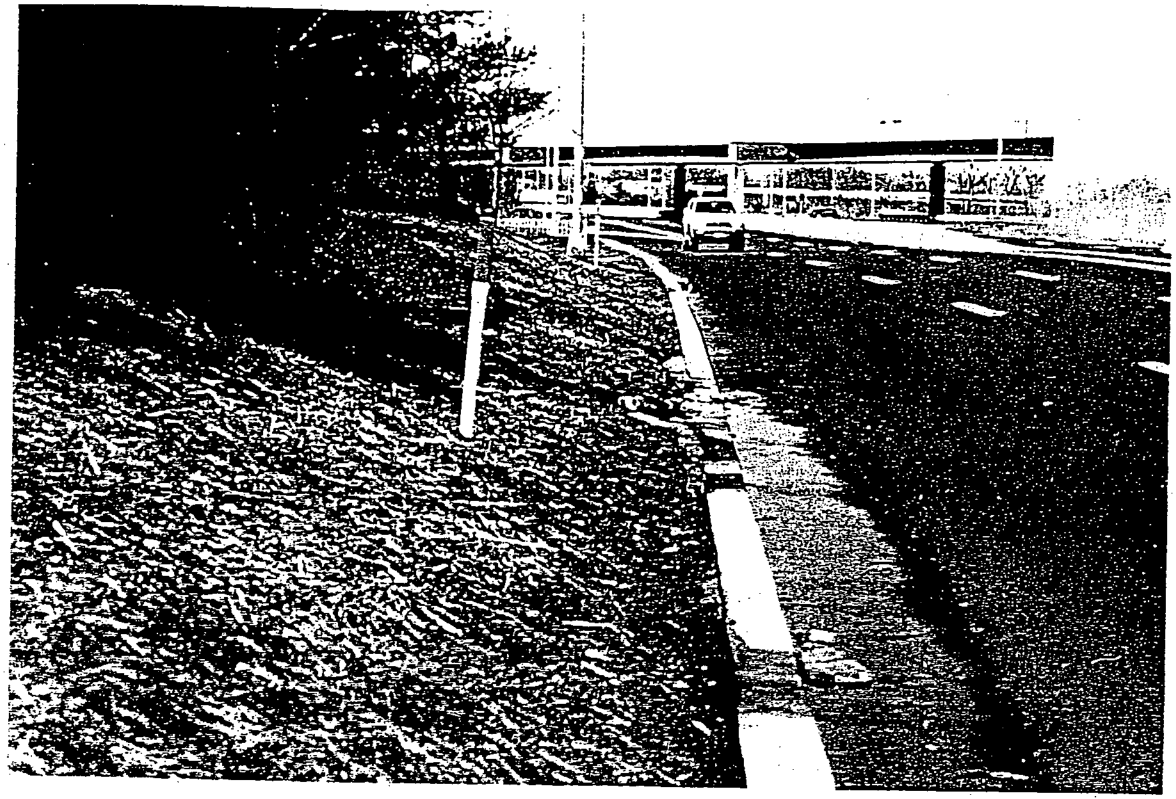


Photo No. 1. Leachate Seeping into Harrison Avenue (view northwest)

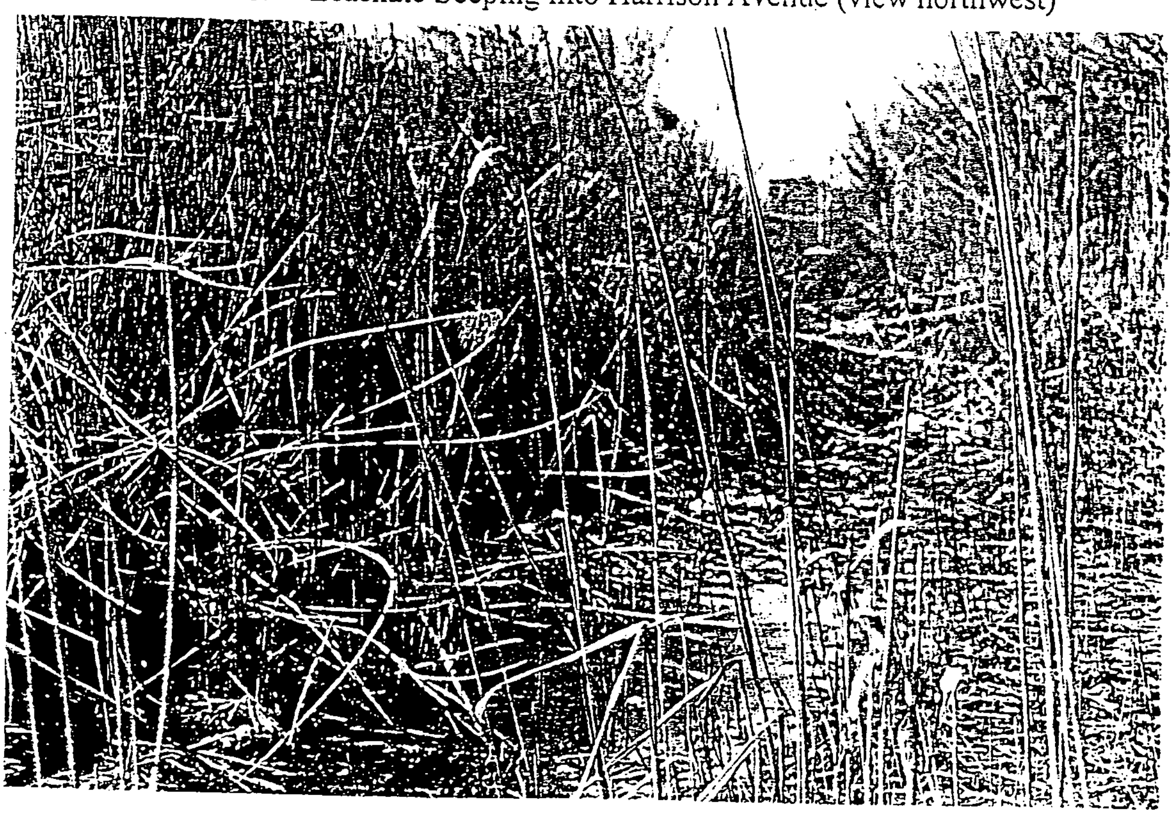


Photo No. 2. Leachate Flowing into Site from Harrison Avenue (view south)

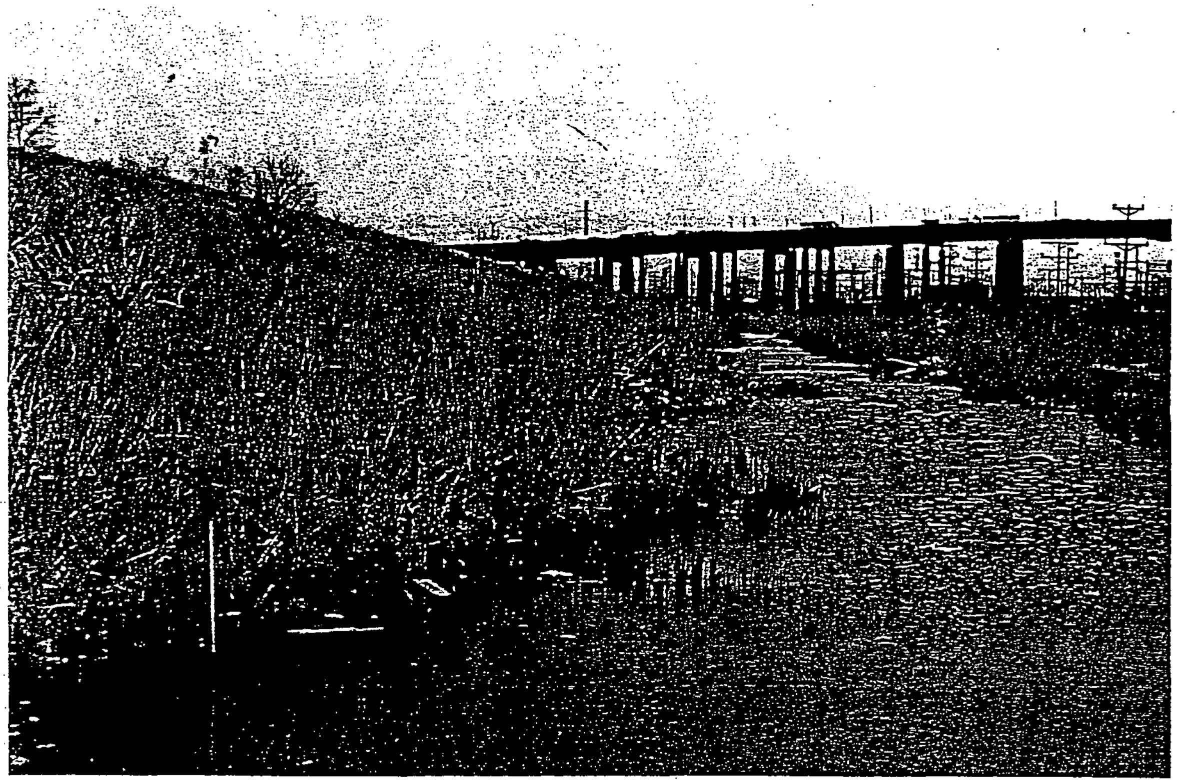


Photo No. 7. Ponded Leachate at Southwest End of Site (view east)

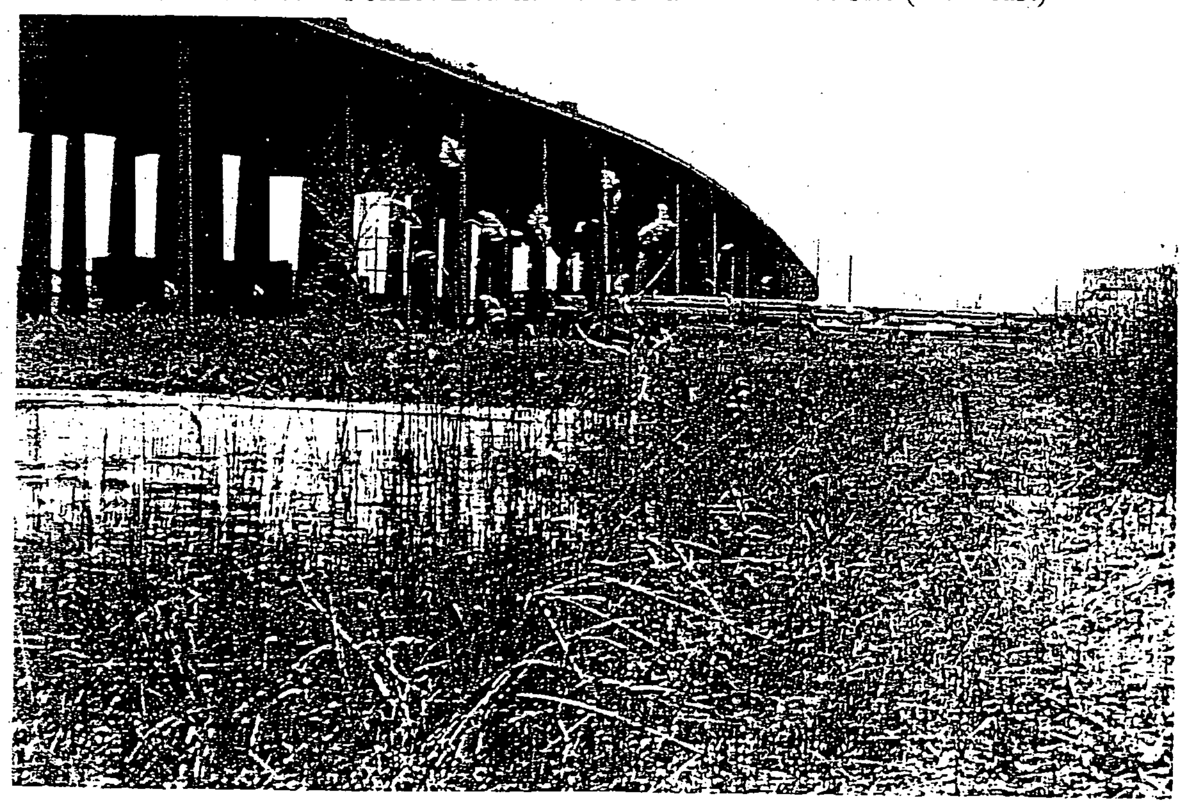


Photo No. 8. Ponded Leachate along Eastern End of Site. Turnpike and Railroad (view south)

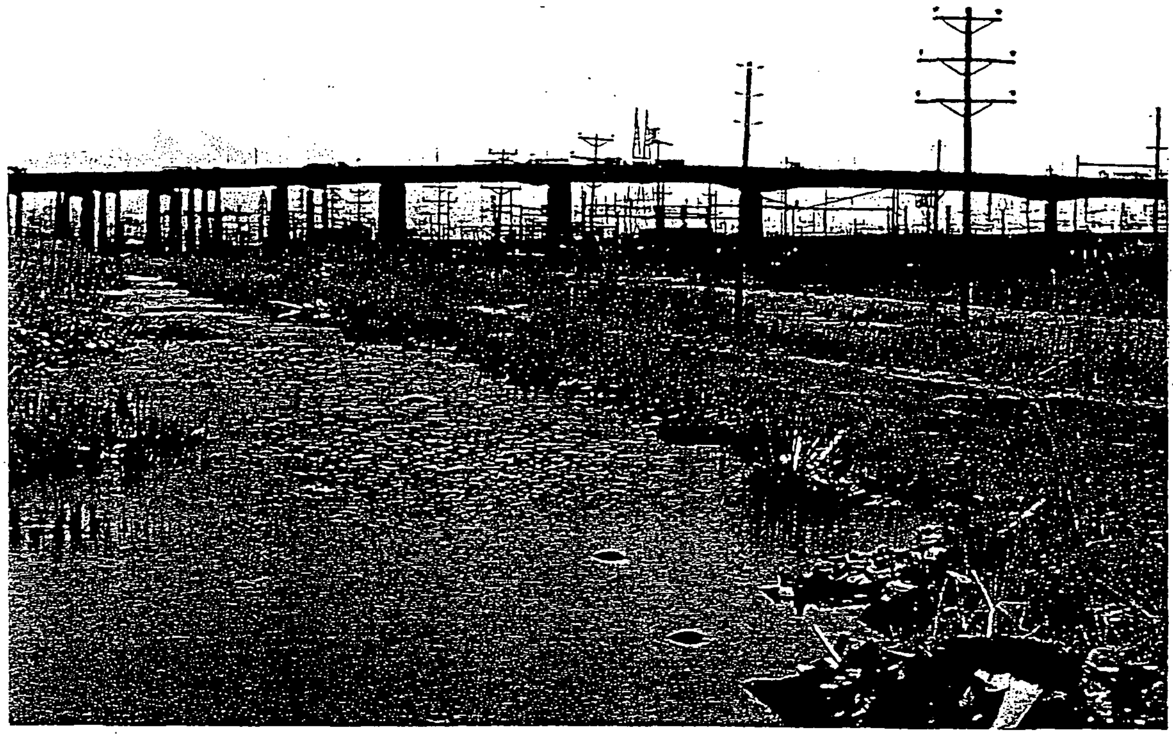


Photo No. 9. Ponded Leachate along Access Road at Southern End of Site (view west)

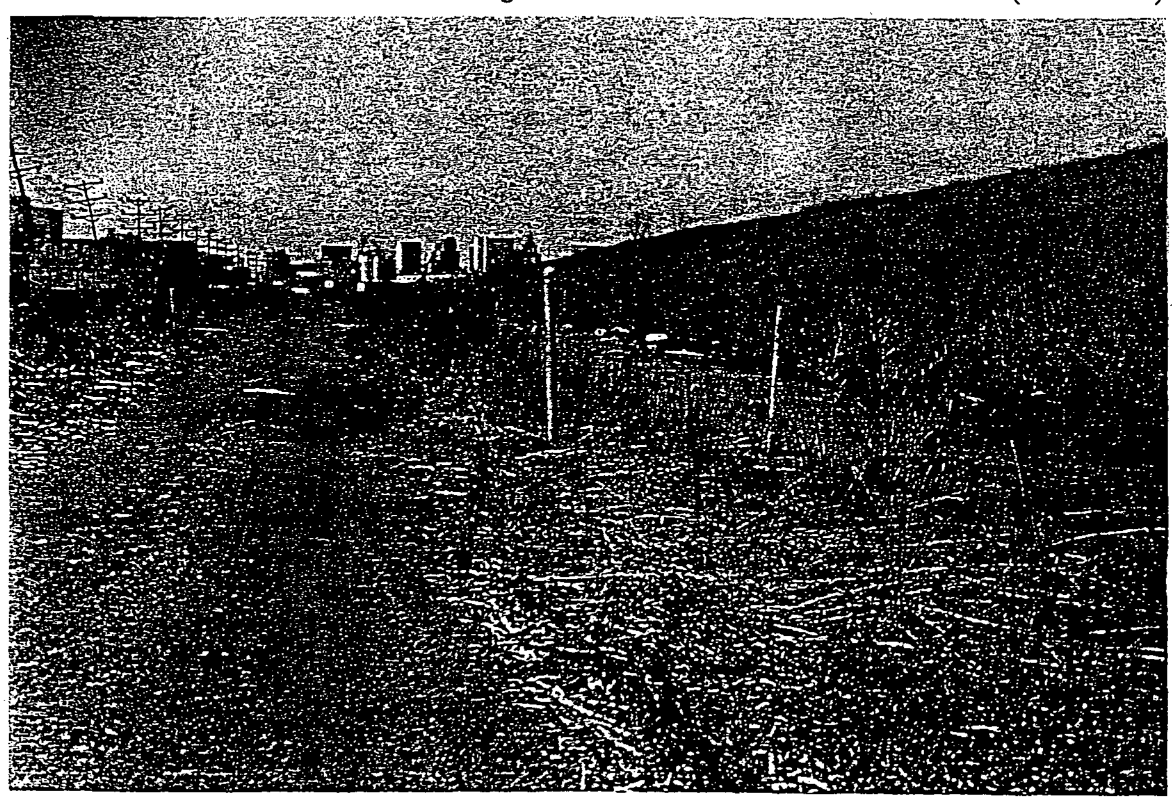


Photo No. 10. Ponded Leachate along Access Road at Southern End of Site (view east)

WARREN GEORGE, INC.
FOOT OF JERSEY AVENUE
P. O. BOX 413
JERSEY CITY, N.J. 07303

...CATION: Land Fill I.D.
...arny N.J.

FOR: M.S.L.A.

SHEET 1 OF 1
LOCATION Kearny N.J.
HOLE NO. 1
LINE & STA.
OFFSET

DEPTH ______ FT. ____ FT. CASING OUT DATE: ______
DEPTH ______ FT. ALL CASING OUT DATE: ______

DATE, START: 10/2/85
DATE, FINISH: 10/2/85

GROUND ELEVATION ______
GROUND WATER ELEVATION 5'

CASING O.D. 6"-auger I.D. ______
SAMPLER O.D. 2" I.D. ______
DIAMOND BIT SIZE ______

WEIGHT OF HAMMER 140 LBS.
INSIDE LENGTH OF SAMPLER ______ IN.

HAMMER FALL
CASING ______ SAMPLER 30"

Depth below surface	Casing blows per foot	Sample number	Sample depths elev. / feet	Sample recovery	Blows per 6" on sampler 0-6	6-12	12-18	Density or consist. moisture	Profile change depth	Field identification of soils remarks
0		1	0'-2'		3-	10-	5-4			
		2	5'-5'3"		100/3"					
10		3	10'-12'		8-	8-	9-11			
		4	15'-17'		3-	6-	3-2			
									0'-20'	Miscellaneous Garbage fill
20		5	20'-22'		6-	8-	11-13		20'-22'	Brown organic fine sand
									22'-24'	Brown organic Peat
		6	25'-27'		3-	1-	0-1		24'-27'	Gray brown fine Sand
30										
40										

CATION: ...L.A. Site ID
...arny N.J.

WARREN GEORGE, INC.

FOOT OF JERSEY AVENUE
P. O. BOX 413
JERSEY CITY, N.J. 07303

FOR: M.S.L.A.

SHEET 1 OF 1
LOCATION Kearny N.J.
HOLE NO. 2
LINE & STA.
OFFSET

DEPTH ____ FT. ____ FT. CASING OUT DATE: ____
DEPTH ____ FT. ALL CASING OUT DATE: ____

DATE, START: 10/3/85
DATE, FINISH: 10/3/85

GROUND ELEVATION
GROUND WATER ELEVATION 3'

CASING O.D. 6" auger I.D. ____
SAMPLER O.D. 2" I.D. ____
DIAMOND BIT SIZE ____

WEIGHT OF HAMMER 140 LBS.
INSIDE LENGTH OF SAMPLER ____ IN.

HAMMER FALL
CASING ____ SAMPLER 30"

DEPTH BELOW SURFACE	CASING BLOWS PER FOOT	SAMPLE NUMBER	SAMPLE DEPTHS ELEV. / FEET	SAMPLE RECOVERY	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	DENSITY OR CONSIST. MOISTURE	PROFILE CHANGE DEPTH	FIELD IDENTIFICATION OF SOILS REMARKS
0		1	0'-2'		2-	8-	12-12			
		2	5'-7'		10-	12-	5-10			
10		3	10'-12'		4-	2-	2-1			
		4	15'-17'		7-	4-	5-6			
20									0'-21'	Miscellaneous Garbage fill
		5	20'-22'		7-	11-	9-20		21'-22'6"	Brown fine Sand
									22'6"-23'	Brown Peat
30										

JOB LOCATION: M.S.L.A. Landfill ID

Kearny N.J.

WARREN GEORGE, INC.

FOOT OF JERSEY AVENUE
P. O. BOX 413
JERSEY CITY, N.J. 07303

FOR: M.S.L.A.

SHEET ___ OF ___
LOCATION Kearny N.J.
HOLE NO. 3
LINE & STA. ___
OFFSET ___

DEPTH ___ FT. ___ FT. CASING OUT DATE: ___
DEPTH ___ FT. ALL CASING OUT DATE: ___

DATE, START: 10/4/85
DATE, FINISH: 10/4/85

GROUND ELEVATION ___
GROUND WATER ELEVATION 2'6"

CASING O.D. 6" auger I.D. ___
SAMPLER O.D. 2" I.D. ___
DIAMOND BIT SIZE ___

WEIGHT OF HAMMER 140 LBS.
INSIDE LENGTH OF SAMPLER ___ IN.

HAMMER FALL
CASING ___ SAMPLER 30"

DEPTH BELOW SURFACE	CASING BLOWS PER FOOT	SAMPLE NUMBER	SAMPLE DEPTHS ELEV. / FEET	SAMPLE RECOVERY	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	DENSITY OR CONSIST. MOISTURE	PROFILE CHANGE DEPTH	FIELD IDENTIFICATION OF SOILS REMARKS
0										
		1	5'-7'		100/6"					
10									0'-10'	Miscellaneous Garbage fill
		2	10'-12'		9-	11-	13-12			Gray medium-fine Sand
									10'-13'	
									13'-15'	Gray sandy organic silt
		3	15'-17'		9	6-	4=4		15'-16'	Brown Peat
									16'-17'	Red coarse-fine Sand
20										
30										
40										

26.17.'31

JOB LOCATION:	WARREN GEORGE, INC.	SHEET 1 OF 1
M.S.L.A. Landfill ID	FOOT OF JERSEY AVENUE	LOCATION Kearny N.J.
Kearny N.J.	P. O. BOX 413	HOLE NO. 4
	JERSEY CITY, N.J. 07303	LINE & STA.
	FOR: M.S.L.A.	OFFSET

DEPTH ___ FT. ___ FT. CASING OUT DATE: ___	DATE, START: 10/8/85	GROUND ELEVATION
DEPTH ___ FT. ALL CASING OUT DATE: ___	DATE, FINISH: 10/8/85	GROUND WATER ELEVATION 3'8"

CASING O.D. 6" auger I.D.	WEIGHT OF HAMMER 140 LBS.	HAMMER FALL
SAMPLER O.D. 2" I.D.	INSIDE LENGTH OF SAMPLER ___ IN.	CASING ___ SAMPLER 30"
DIAMOND BIT SIZE		

DEPTH BELOW SURFACE	CASING BLOWS PER FOOT	SAMPLE NUMBER	SAMPLE DEPTHS ELEV. / FEET	SAMPLE RECOVERY	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	DENSITY OR CONSIST. MOISTURE	PROFILE CHANGE DEPTH	FIELD IDENTIFICATION OF SOILS REMARKS
0										
		1	5'-7'		7-	6-	5-8			
10									0'-10'	Miscellaneous garbage fill
		2	10'-12'		2-	1-	0-1		10'-12'	Black Silt & Brown Peat
20										
30										
40										

JOB LOCATION:	WARREN GEORGE, INC.	SHEET 1 OF 1
M.S.L.A. Landfill ID	FOOT OF JERSEY AVENUE	LOCATION Kearny N.J.
Kearny N.J.	P. O. BOX 413	HOLE NO. 5
	JERSEY CITY, N.J. 07303	LINE & STA.
	FOR: M.S.L.A.	OFFSET

DEPTH ___ FT. ___ FT. CASING OUT DATE: ___	DATE, START: 10/8/85	GROUND ELEVATION
DEPTH ___ FT. ALL CASING OUT DATE: ___	DATE, FINISH: 10/8/85	GROUND WATER ELEVATION 4'6"

CASING O.D. 6" auger I.D. ___	WEIGHT OF HAMMER 140 LBS.	HAMMER FALL
SAMPLER O.D. ___ I.D. ___	INSIDE LENGTH OF SAMPLER ___ IN.	CASING ___ SAMPLER 30"
DIAMOND BIT SIZE ___		

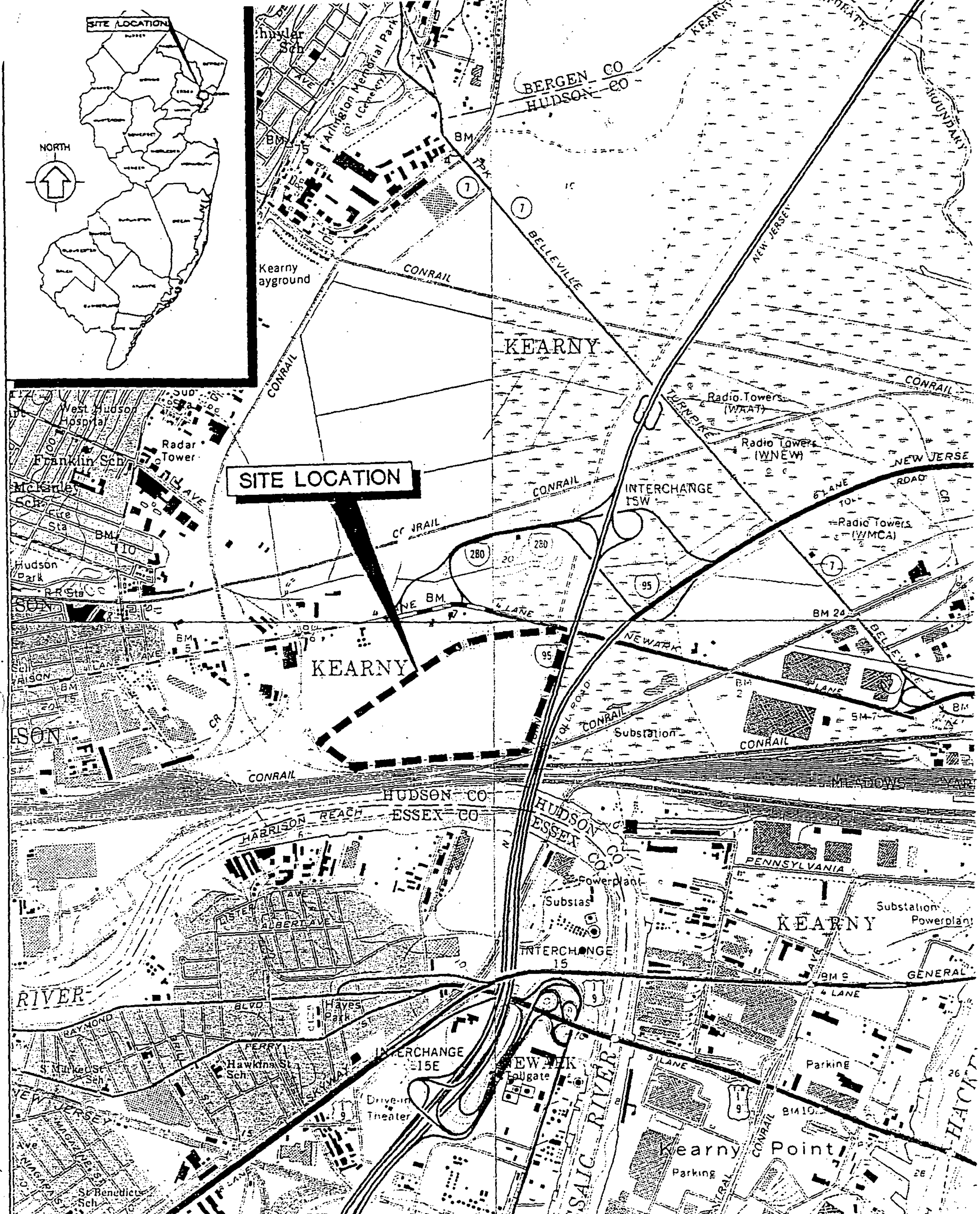
DEPTH BEL-OW SURFACE	CASING BLOWS PER FOOT	SAMPLE NUMBER	SAMPLE DEPTHS ELEV. / FEET	SAMPLE RECOVERY	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	DENSITY OR CONSIST. MOISTURE	PROFILE CHANGE DEPTH	FIELD IDENTIFICATION OF SOILS REMARKS
0										
		1	5'-7'		6-	8-	7-5			
10										
		2	10'-12'		5-	7-	3-2			
									0'-15'	Miscellaneous Garbage Fill
									15'-16'	Gray medium-fine Sand
		3	15'-17'		4-	2-	2-1		16'-17'	Gray silty fine sand, some Peat
20										
30										
40										

JOB LOCATION:	WARREN GEORGE. INC.	
M.S.L.A. Landfill ID	FOOT OF JERSEY AVENUE	SHEET 1 OF 1
Kearny N.J.	P. O. BOX 413	LOCATION Kearny N.J.
	JERSEY CITY, N.J. 07303	HOLE NO. 6
		LINE & STA.
	FOR: M.S.L.A.	OFFSET

DEPTH ____ FT. ____ FT. CASING OUT DATE:	DATE, START: 10/7/85	GROUND ELEVATION
DEPTH ____ FT. ALL CASING OUT DATE:	DATE, FINISH: 10/7/85	GROUND WATER ELEVATION 9'

CASING O.D. 6" auger I.D.	WEIGHT OF HAMMER 140 LBS.	HAMMER FALL
SAMPLER O.D. 2" I.D.	INSIDE LENGTH OF SAMPLER ____ IN.	CASING ____ SAMPLER 30"
DIAMOND BIT SIZE		

DEPTH BELOW SURFACE	CASING BLOWS PER FOOT	SAMPLE NUMBER	SAMPLE DEPTHS ELEV. / FEET	SAMPLE RECOVERY	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	DENSITY OR CONSIST. MOISTURE	PROFILE CHANGE DEPTH	FIELD IDENTIFICATION OF SOILS REMARKS
0										
		1	5'-7'		7-	12-	16-13			
10										
		2	10'-12'		8-	16-	34-100			
		3	15'-17'		100/0" N.R.					
20									0'-21'6"	Miscellenous Garbage fill
		4	20'-22'		8-	4-	3-3		21'-6"-22'	Gray organic silt
30										



Source: USGS 7.5 Min. Quadrangle, Orange, N.J.

Scale: 1" = 2000'

N.J. Department of Environmental Protection	MSLA-1D LANDFILL, KEARNY, NEW JERSEY **SITE LOCATION MAP** NJDEP CONTRACT No. A-85149	Louis Berger & Assoc. 30 Vreeland Road Florham Park, NJ	**FIGURE 1**

MSLA-1.0 MAY99/U4

LEGEND:

- PARCEL LINES
- 10' CONTOUR INTERVAL LINES
- OTHER CONTOUR LINES

Source: HMDC And Municipal Tax Maps, March 1999.

0 150 300 600

SCALE IN FEET
1"= 300'

MSLA-SP/10MAY99/U4

N.J. Department of Environmental Protection

MSLA 1-D LANDFILL, KEARNY, NEW JERSEY

SITE PLAN

NJDEP CONTRACT No. A-85149

Louis Berger & Associates
30 Vreeland Road
Florham Park, NJ

Central Salvage

Classification Exception Area/Well Restriction Area Fact Sheet

CEA ID: # 1183

Case Information

CSL ID:	NJL800287195		
Case Name:	CENTRAL SALVAGE COMPANY		
Address:	1221 HARRISON AVE		
City:	KEARNY	**County:**	HUDSON

Lot and Block of the Site

Block	*Lot*
284	6

See Exhibit A [Site Location Map]

Lot and Block of the CEA

Block	*Lot*	*Municipality*
284	6	Kearny, Hudson County

Facility Contact

Site Contact Person: John Krauser
Company: Vineland Construction
Address: 71 W. Park Ave.
Vineland, NJ 08360
phone number:

DEP Lead Program (including phone number)

Lead Program: BUST
Contact: ELAINE DE WAN
Phone Number: 609-633-7053

Department Oversight Document Approved 12/16/99

CEA Information

Description: CEA encompasses the entire site

Affected Aquifer(s): *Aquifer*
Glacial Drift

Vertical Depth:
GW Classification: II-A

Contaminant Concentrations

This CEA/WRA applies only to the contaminants listed in the table below, The ground water quality criteria / primary drinking water standards for these contaminants are listed in parts per billion (ppb). All constituents standards (N.J.A.C. 7:9:9-6) apply at the designated boundary.

Contaminant	Concentration [1]	GWQS [2]	SDW [3]
Lead	173 ppb	10.0 ppb	
Arsenic	10.4 ppb	8.0 ppb	

Note: 1 Maximum concentration detected at the time of CEA establishment
2 Ground Water Quality Standards
3 Safe Drinking Water Maximum Concentratrion Level

CEA Boundaries:

horizontal boundaries: See Exhibit B (CEA/WRA Location Map)
vertical boundaries: Included in affected aquifer above

Projected Term of CEA:

Established: 12/16/99
Duration: Indeterminant
Lifted:

Comments:

Note: **Since groundwater quality data indicates exceedance of contaminants above the Primary Drinking Water Standards, and the designated uses of Class II-A aquifers include potable use, the CEA established for this site is also a Well restriction Area. The extent of Well Restriction shall coincide with the boundaries of the CEA**

Well Restrictions set within the boundaries of the CEA

1. With the exception of monitoring wells installed into the first water bearing zone, any proposed well to be installed within the CEA/WRA boundary shall be double cased to an appropriate depth in order to prevent any vertical contaminant migration pathways. This depth is either into a confining layer or 50 feet below the vertical extent of the CEA.
2. Any potable well to be installed within the footprint of the CEA/WRA shall be sampled annually for the parameters of concern. The first sample shall be collected prior to using the well. If contamination is detected, contact your local Health Department. If the contamination is above the Safe Drinking Water Standards, then the NJDEP Hot Line should be called. Treatment is required for any well that has contamination above the Safe Drinking Water Standards.
3. Any proposed high capacity production wells in the immediate vicinity of the CEA/WRA should be pre-evaluated to determine if pumping from these wells would draw a portion of the contaminant plume into the cone of capture of the production wells or alter the configuration of the contaminant plume.

Classification Exception Area/Well Restriction Area Fact Sheet

CEA ID: # 1186

Case Information

CSL ID: NJL800287195
Case Name: CENTRAL SALVAGE COMPANY
Address: 1221 HARRISON AVE
City: KEARNY **County:** HUDSON

Lot and Block of the Site

Block	*Lot*
284	3A,4,5 & 6

See Exhibit A [Site Location Map]

Lot and Block of the CEA

Block	*Lot*	*Municipality*
block 284	3A	Kearny, Hudson County
block 284	4	Kearny, Hudson County
284	5	Kearny, Hudson County
284	6	Kearny, Hudson County

Facility Contact

Site Contact Person: Krauser John
Company:
Address:
,
phone number:
Site Contact Person: John Cassini
Company:
Address: 20 Mountain Oaks
West Orange, NJ 07052
phone number:

DEP Lead Program (including phone number)

Lead Program: BUST
Contact: ELAINE DE WAN
Phone Number: 609-633-7053

Department Oversight Document Approved 12/16/99

CEA Information

Description: CEA extens 388 feet from MW2 to the west

Affected Aquifer(s): *Aquifer*

Glacial Drift

Vertical Depth: 20 Feet

GW Classification: II-A

Contaminant Concentrations

This CEA/WRA applies only to the contaminants listed in the table below, The ground water quality criteria / primary drinking water standards for these contaminants are listed in parts per billion (ppb). All constituents standards (N.J.A.C. 7:9:9-6) apply at the designated boundary.

Contaminant	Concentration [1]	GWQS [2]	SDW [3]
Benzene	50.6 ppb	1.0 ppb	1.0 ppb
Methyl tertiary butyl ether (MTBE)	577 ppb	70.0 ppb	70.0 ppb
Tertiary butyl alcohol (TBA)	184 ppb	100 ppb	

Note: 1 Maximum concentration detected at the time of CEA establishment

2 Ground Water Quality Standards

3 Safe Drinking Water Maximum Concentratrion Level

CEA Boundaries:

horizontal boundaries: See Exhibit B (CEA/WRA Location Map)

vertical boundaries: Included in affected aquifer above

Projected Term of CEA:

Established: 12/16/99

Duration: 4.09 Years

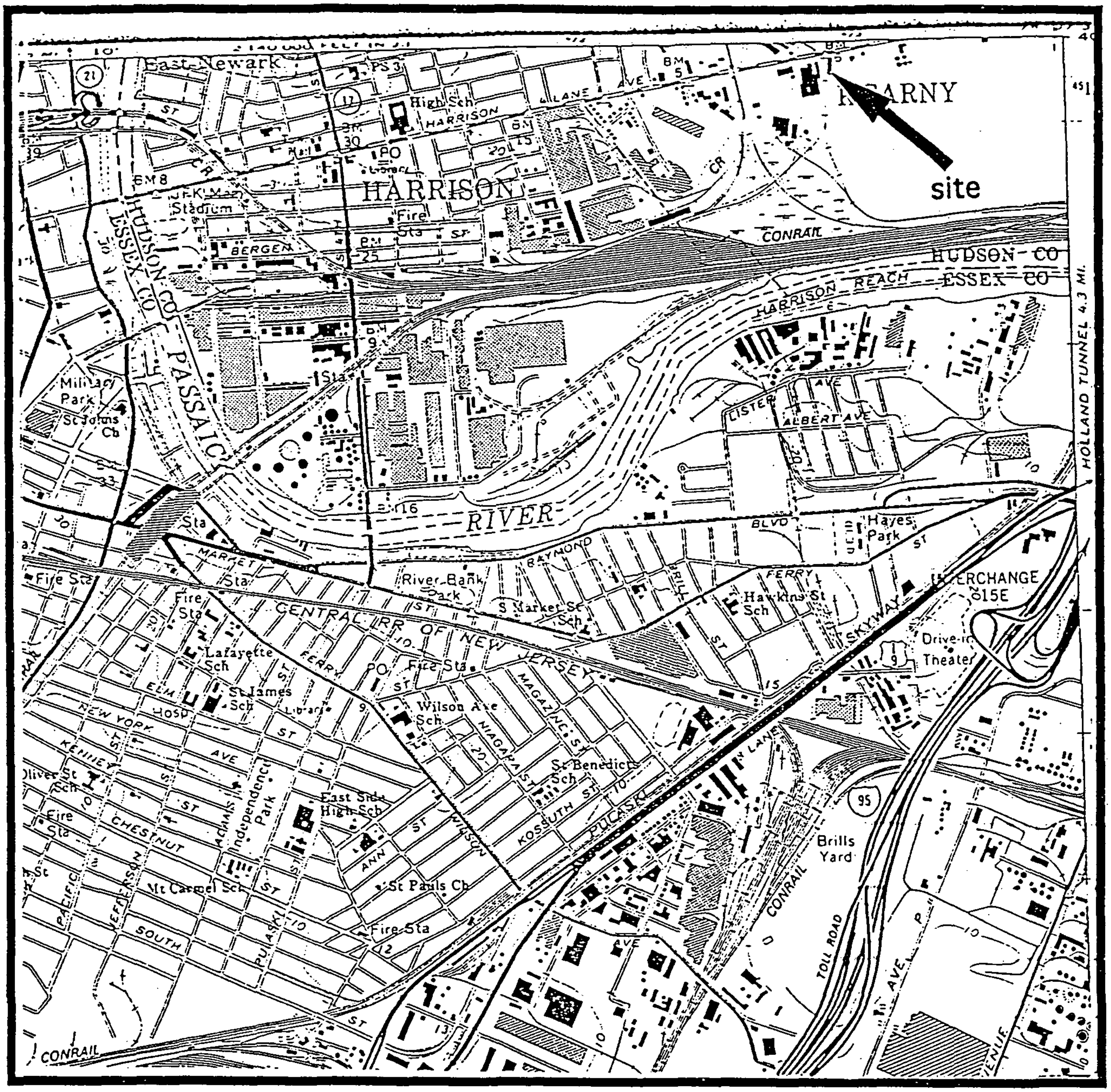
Lifted:

Comments: CEA extends 388 feet from MW2 to the west

Note: **Since groundwater quality data indicates exceedance of contaminants above the Primary Drinking Water Standards, and the designated uses of Class II-A aquifers include potable use, the CEA established for this site is also a Well restriction Area. The extent of Well Restriction shall coincide with the boundaries of the CEA**

Well Restrictions set within the boundaries of the CEA

1. With the exception of monitoring wells installed into the first water bearing zone, any proposed well to be installed within the CEA/WRA boundary shall be double cased to an appropriate depth in order to prevent any vertical contaminant migration pathways. This depth is either into a confining layer or 50 feet below the vertical extent of the CEA.
2. Any potable well to be installed within the footprint of the CEA/WRA shall be sampled annually for the parameters of concern. The first sample shall be collected prior to using the well. If contamination is detected, contact your local Health Department. If the contamination is above the Safe Drinking Water Standards, then the NJDEP Hot Line should be called. Treatment is required for any well that has contamination above the Safe Drinking Water Standards.
3. Any proposed high capacity production wells in the immediate vicinity of the CEA/WRA should be pre-evaluated to determine if pumping from these wells would draw a portion of the contaminant plume into the cone of capture of the production wells or alter the configuration of the contaminant plume.



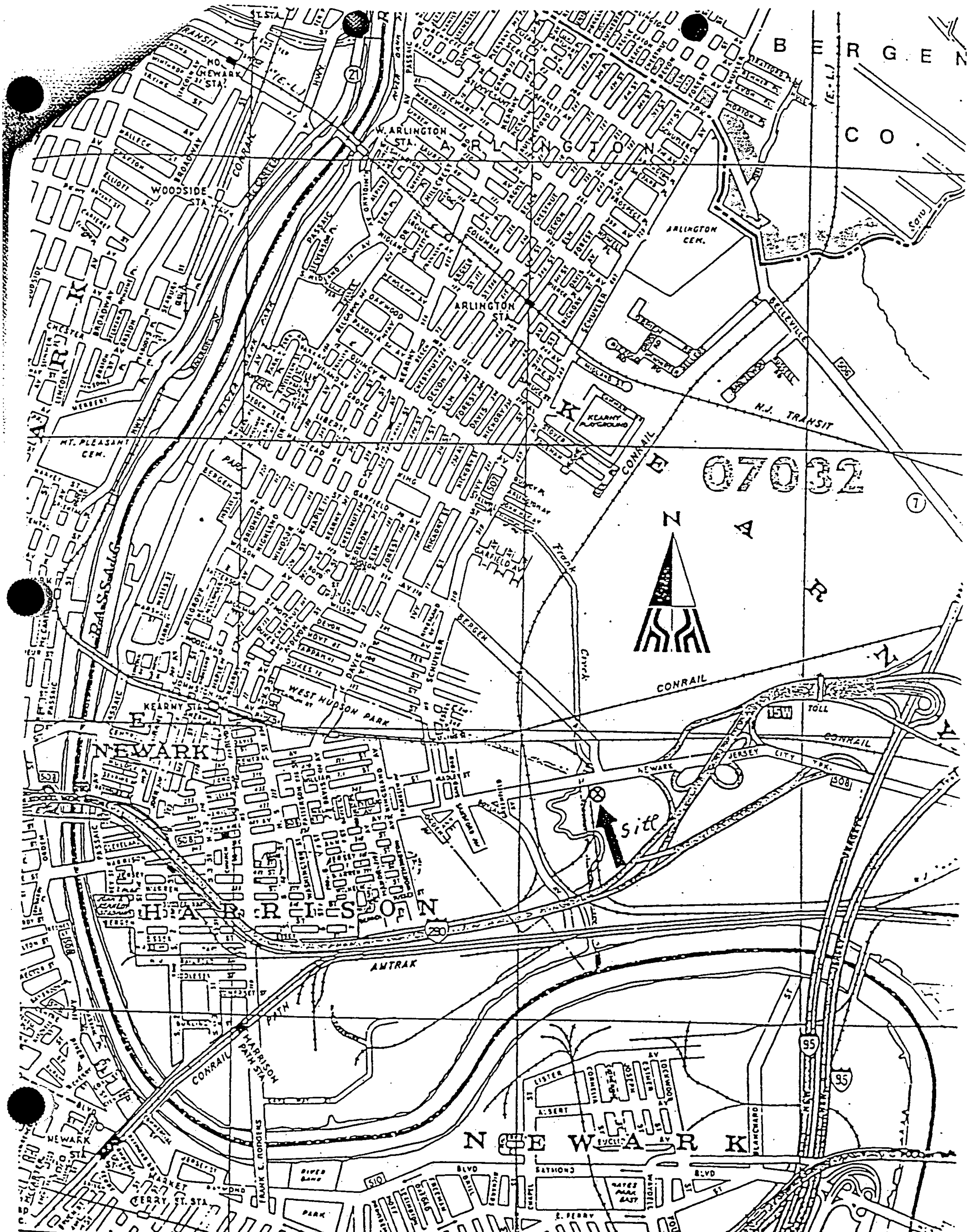
Scale

1: 24,000

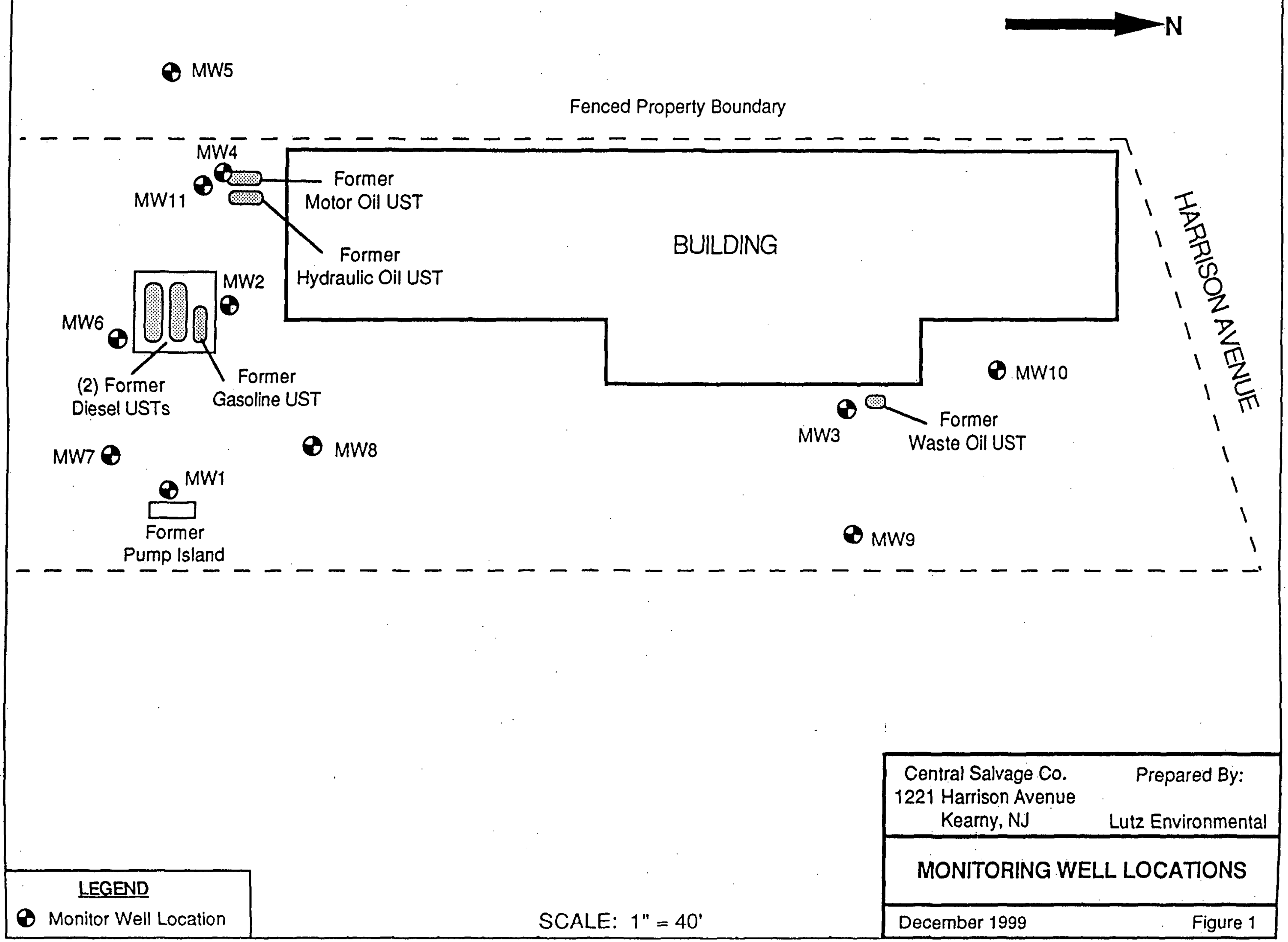
N

Central Salvage Co. Harrison Avenue Kearny, NJ	Prepared By: Lutz Environmental
SITE LOCATION MAP	
December 1996	Figure 1

Source: Elizabeth, NJ
USGS 7.5 Minute Quadrangle



BERGEN CO.
ARLINGTON
ARLINGTON CEM.
ARLINGTON STA.
W. ARLINGTON STA.
WOODSIDE STA.
NO. NEWARK STA.
MT. PLEASANT CEM.
KEARNY PLAYGROUND
KEARNY
07032
N
N.J. TRANSIT
CONRAIL
PASSAIC
WEST HUDSON PARK
EAST NEWARK
HARRISON
AMTRAK
NEWARK
JERSEY CITY TPK.
site
HARRISON PATH STA.
PATH
RIVERBANK PARK
NEWARK
PENN. STA.



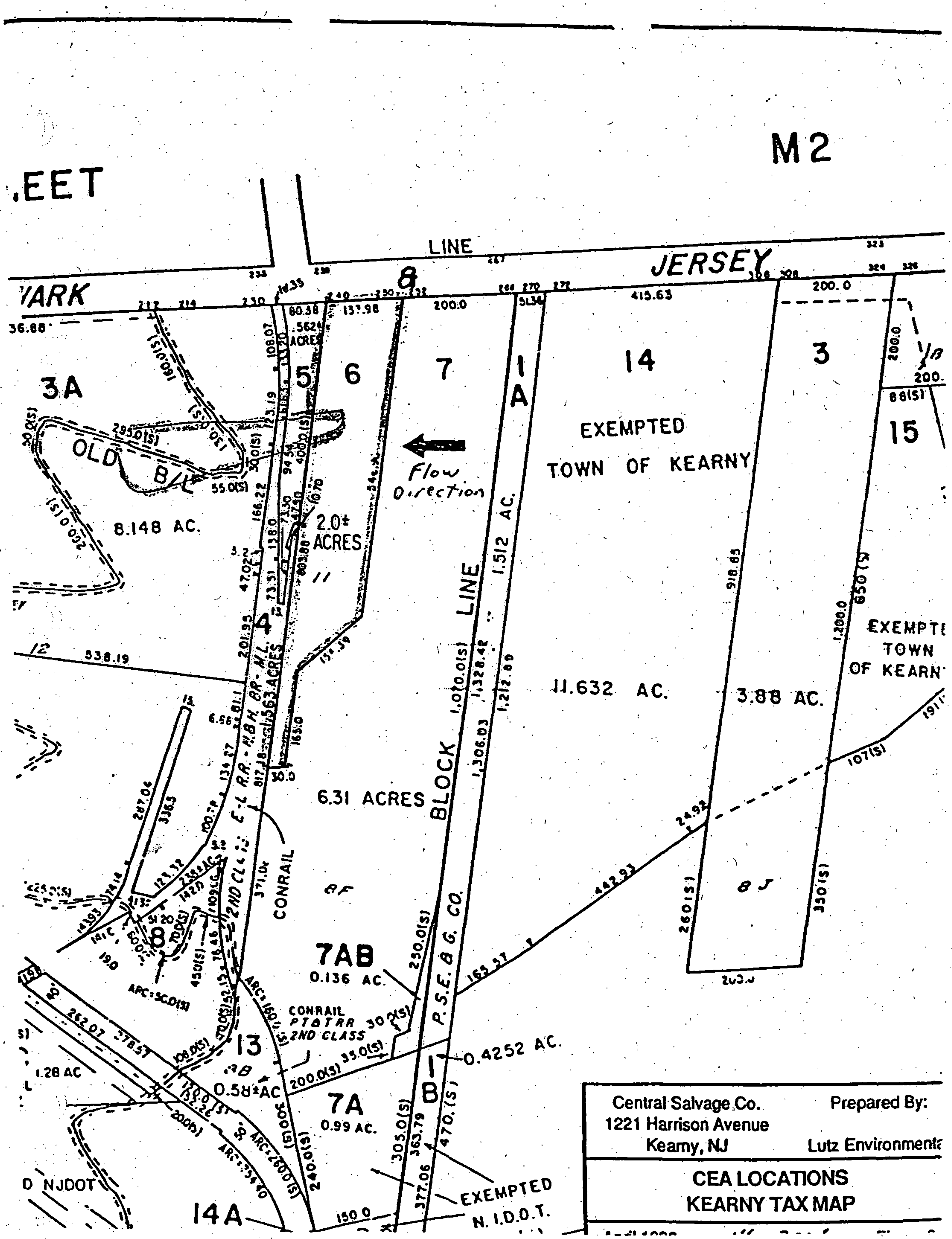
Central Salvage Co.
1221 Harrison Avenue
Kearny, NJ

Prepared By:
Lutz Environmental

MONITORING WELL LOCATIONS

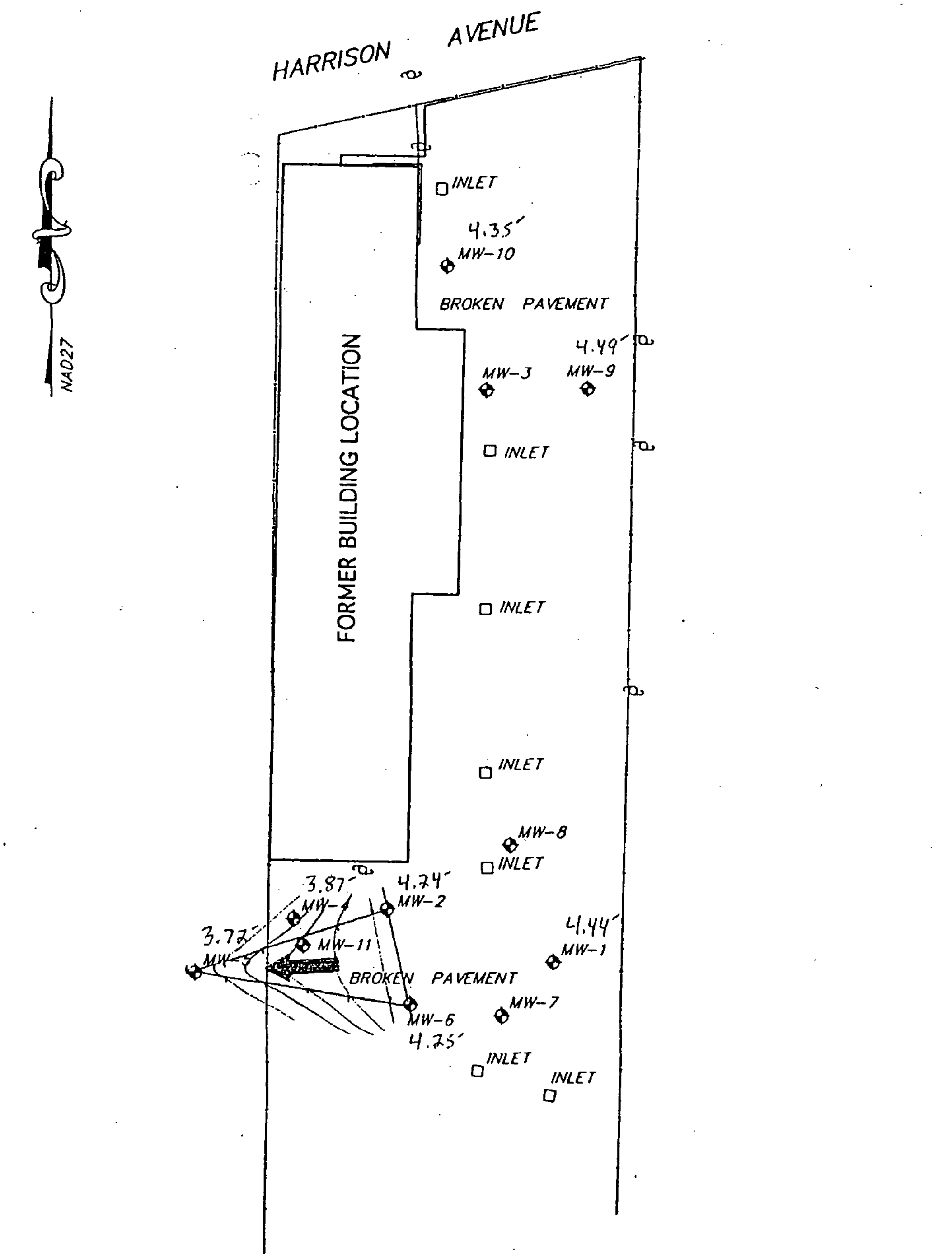
December 1999

Figure 1



M2
.EET
LINE
JERSEY
/ARK
3A
5
6
7
1
A
14
3
15
EXEMPTED
TOWN OF KEARNY
OLD
8.148 AC.
2.0± ACRES
Flow Direction
BLOCK LINE
1.512 AC.
11.632 AC.
3.88 AC.
EXEMPTE
TOWN
OF KEARN
6.31 ACRES
CONRAIL
E-L R.R.-N.B.H. BR.-M.L.
2ND CL.
7AB
0.136 AC.
CONRAIL
P.T.&T.R.R.
2ND CLASS
P.S.E.&G. CO.
13
0.58±AC
7A
0.99 AC.
0.4252 AC.
1
B
1.28 AC
NJDOT
14A
EXEMPTED
N.I.D.O.T.
Central Salvage Co.
1221 Harrison Avenue
Kearny, NJ
Prepared By:
Lutz Environmenta
CEA LOCATIONS
KEARNY TAX MAP

GROUNDWATER CONTOUR MAP
January 18, 2000



STIRES ASSOCIATES, P.A.
ENGINEERS – PLANNERS – SURVEYORS
43 West High Street, Somerville, New Jersey 08876
Phone (908) 725-0230 Fax (908) 707-0831
SINCE 1956

WELL LOCATION PLAN
CENTRAL SALVAGE COMPANY
TOWN OF KEARNEY HUDSON COUNTY
NEW JERSEY

RICHARD C. MATHEWS
PROFESSIONAL LAND SURVEYOR N.J. LICENSE No. 29353
DATE 2/16/2000

PROJECT No. 00027 ref 97060	DRAWN BY: RCM	CHECKED BY:	SCALE: 1" = 50'	DATE	REVISION	BY

State of New Jersey
Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

Bureau of Underground Storage Tanks
P.O. Box 433
401 East State Street
Trenton, NJ 08625

DEC 16 1999

Mr. John Krauser
National Freight, Inc.
71 West Park Avenue
Pineland, NJ 08360

Mr. John Cassini
Llewellyn Pike
20 Mountain Oaks
West Orange, NJ 07052

Re: Central Salvage Company
1221 Harrison Avenue
Kearny, Hudson County
Case #97-01-28-0847-35; UST # 0316848
Remedial Action Workplan Dated: June 1998 & Deed Notice Executed July 21, 1999

Dear Sirs:

Pursuant to the Authority vested in the Commissioner of the New Jersey Department of Environmental Protection (Department) by the Underground Storage of Hazardous Substances Act (N.J.S.A.58:10A-21 et seq.) & duly delegated to the Assistant Director of the Industrial Site Evaluation Element, the above referenced Remedial Action Workplan (RAW), submitted by Lutz Environmental Company, Inc., is hereby approved by the Department as conditioned below:

National Freight, Inc. shall initiate the RAW, as conditioned in this RAW Approval, within forty-five (45) days of receipt of this letter and begin implementation of this RAW according to the proposed time schedule. If any current or anticipated delay is caused by events beyond the control of National Freight, Inc., then National Freight, Inc. shall notify the Department in writing within 10 calendar days of such event. National Freight, Inc. shall precisely describe the cause of the delay and request an extension. Increases in the costs or expenses incurred in fulfilling the requirements outlined in this letter shall not be considered a basis for an extension and such extension requests will not be granted.

I. Approved Cleanup Levels -Ground Water Cleanup Levels in accordance with the Ground Water Quality Standards N.J.A.C. 7:9-6.

Compound	Cleanup Levels (ppb)
Volatile Organics	
Benzene	1
Ethylbenzene	700
Methyl-tert-butyl ether (MTBE)	70
Tert-butyl alcohol (TBA)	100
Toluene	1,000
Xylenes (total)	1,000
Metals	
Lead	10
Arsenic	8

II. Areas of Concern

A. Soils

The entire site contains historic fill material that extends down to 5 feet below grade, which is approximately 1.5 feet into the ground water table. The fill material was found to contain total organic compounds, lead and cadmium above the Department's direct contact cleanup criteria. The Department approved a restricted use remedial action for the historic fill material identified. A deed notice was executed for the site on July 26, 1999 and is recorded in Book 5478 pages 142 through and including 163.

B. Ground Water

During the closure/removal of (2) 3000 gallon diesel, (1) 1000 gallon gasoline, (1) 1000 gallon motor oil and (1) 550 gallon waste oil USTs systems, ground water was encountered in the excavations and monitoring wells were subsequently installed. Monitoring well MW-1 was installed adjacent to the pump island, MW-2 adjacent to the gasoline/diesel UST excavation, MW-3 adjacent to the waste oil UST and MW-4 adjacent to the motor oil and hydraulic oil USTs. Monitoring wells MW-4 and MW-5 were installed downgradient of MW-2, while MW-6 and MW-7 were installed downgradient of MW-1. Ground water flow direction is predominantly to the west. Ground water contaminants have been consistently identified at monitoring wells MW-1 through MW-4 and MW-9 and MW-10. Two separate contaminant plumes have been identified on site. The analytical results from the April 1999 ground water event indicated that dissolved volatile organic contaminants remain significantly above the Ground Water Quality Standards (GWQS) at MW-1, MW-2, MW-3, MW-4, MW-9 and MW-10. The most elevated concentrations of dissolved contaminants have been reported at MW-2, located adjacent to and north of the diesel and gasoline USTs excavation with benzene at 121 parts per billion (ppb), methyl tert-butyl ether (MTBE) at 577 ppb and tertiary butyl alcohol (TBA) at 146 ppb. In addition, the April 1999 sampling event revealed the following levels at MW-4 (located downgradient of MW-2), benzene at 164 ppb, MTBE at 522 ppb and TBA at 184 ppb. Minimal concentrations of dissolved volatile organic contaminants have also been identified at MW-1 and MW-8.

In addition to the dissolved volatile organic contaminant plume, monitoring wells MW-3, MW-9 and MW-10 contain lead above the GWQS, with the highest concentrations found in MW-10. The last time metals were analyzed in ground water was the April 28, 1998 sampling event which revealed lead at 173 ppb in MW-10. Monitoring well MW-3 also contains arsenic above the GWQS, with a concentration of 10.4 ppb (April 1998 event).

III. Remediation Proposal/Conditions of Approval

A. Summary of Remedial Action Proposal

Natural Remediation is acceptable at this site since horizontal delineation is complete, receptors are not threatened and based on the post-excavation sample results it appears that the source may have been removed.

B. Site Specific Conditions of Approval

1. Classification Exception Area (CEA)

When contamination remains on site above an applicable remediation standard, institutional controls are required pursuant to N.J.S.A. 58:10B-13. Because contaminant levels remain above the Ground Water Quality Standards (GWQS), N.J.A.C. 7:9-6, two Classification Exception Areas (CEA) and Well Restriction Areas (WRA) are required at this time. The Department may establish a CEA and WRA for the affected area to accomplish the institutional control. Pursuant to 7:9-6.6, a CEA may be established when the Department determines that the GWQS will not be met in a localized area due to pollution. Designated uses, for example, use of ground water as a potable water supply, may not be possible without the proper precautions. The Department is also obligated to establish a WRA in conjunction with the CEA where contaminant levels exceed Primary Drinking Water Standards in an aquifer classification that includes potable use.

The regulatory program overseeing the implementation of the CEAs for this site is the Underground Storage of Hazardous Substances Act, N.J.S.A. 58:10A, and its implementing regulation, N.J.A.C. 7:14B-1 - 13 and 15. These

DEED NOTICE

IN ACCORDANCE WITH N.J.S.A. 58:10B-13, THIS DOCUMENT IS TO BE RECORDED IN THE SAME MANNER AS ARE DEEDS AND OTHER INTERESTS IN REAL PROPERTY.

Prepared by:	Recorded by:
John S. Krauser	
Signature	Signature, Officer of County Recording Office
JOHN S. KRAUSER	
Print name below signature	Print name below signature

DEED NOTICE

This Deed Notice is made as of the 21ST day of JULY, 1999, by Vineland Construction Co., 71 West Park Avenue, Vineland, New Jersey 08360 (together with his/her/its/their successors and assigns, collectively "Owner").

WITNESSETH:

WHEREAS, Owner is the owner in fee simple of certain real property designated as Block 284, Lot 6, on the tax map of the Town of Kearny, Hudson County, New Jersey Department of Environmental Protection, known as Contaminated Site List Number NJL800287195, more particularly described on Exhibit A attached hereto and made a part hereof (the "Property"); and

WHEREAS, the lead program during the remediation was Bureau of Underground Storage Tanks, and the program identification number was 97-01-28-0847-35; and

WHEREAS, the New Jersey Department of Environmental Protection ("Department") approved a remedial action on , for Former Central Salvage Co. concerning the Property in which the Department has approved the use of institutional controls and/or engineering controls in accordance with N.J.S.A. 58:10B-13; and

WHEREAS, this Deed Notice itself is not intended to create any interest in real estate in favor of the Department, nor to create a lien against the Property, but merely is intended to provide record or deed notice of certain conditions and restrictions on the property and to reflect the regulatory and statutory obligations imposed as a condition of using institutional and/or engineering controls; and

WHEREAS, the areas described on Exhibit B attached hereto and made a part hereof (the "Affected Areas") contain contaminants above the applicable remediation standards that would allow for the unrestricted use of the Property; and

WHEREAS, the type, concentration and specific location of the contaminants are

CONTAMINANT	CONCENTRATION	LOCATION
Petroleum Hydrocarbons	1,130 - 28,900 ppm	Throughout the entire property to an approximate depth of 5' below grade.
Lead	447 - 3,230 ppm	Throughout the entire property to an approximate depth of 5' below grade.
Cadmium	1.41 - 1.96 ppm	Throughout the entire property to an approximate depth of 5' below grade.

NOTE: The entire site is assumed to contain contaminated historic fill and therefore this Deed Notice (DN) is for the entire site.

TABLE 1

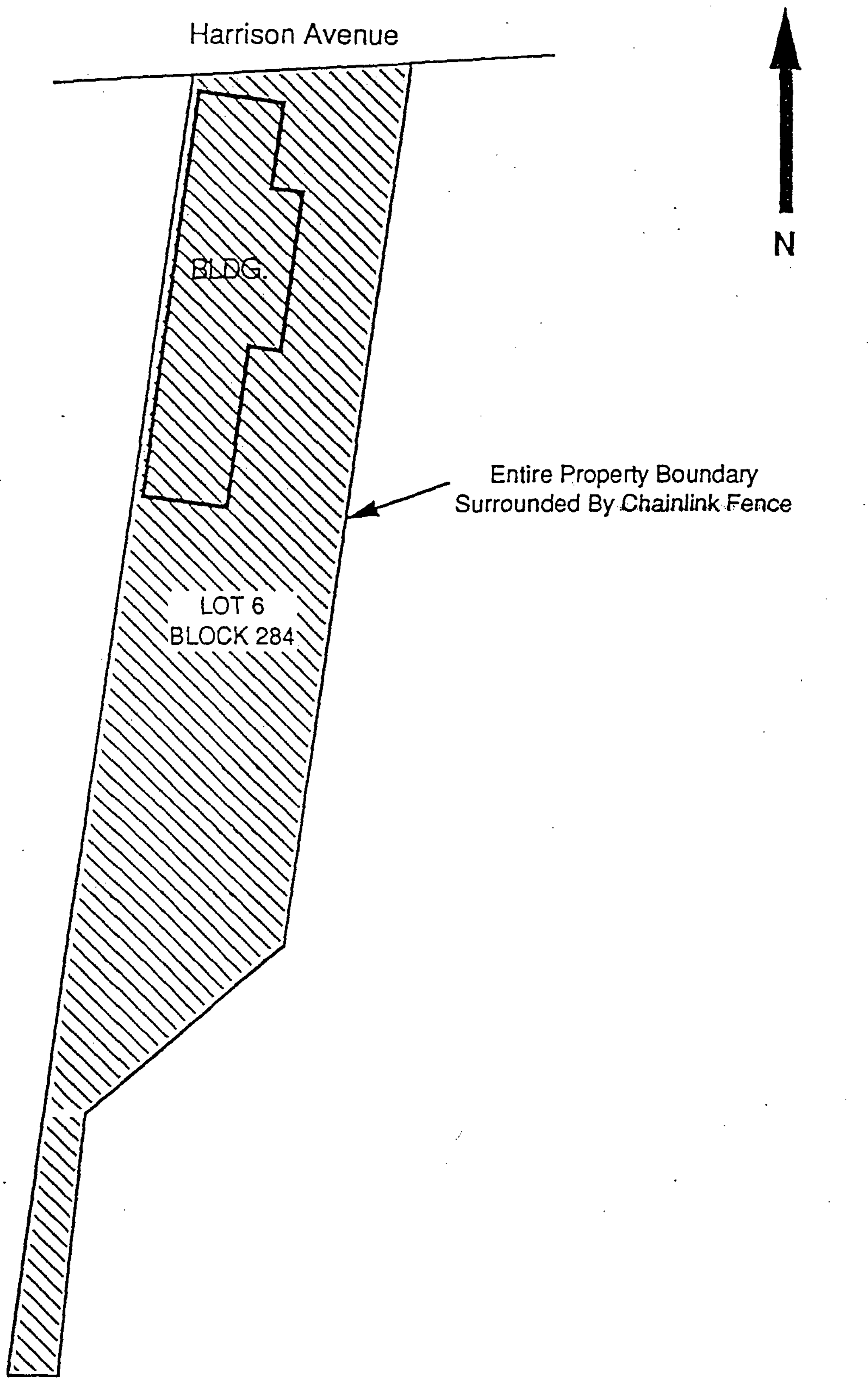
SOIL SAMPLE ANALYTICAL RESULTS
PRIORITY POLLUTANT METALS AND TOTAL PETROLEUM
HYDROCARBON ANALYSES
October 2, 1997
Concentrations in PPM

Compound	HF1	HF1A	HF2	HF2A	HF3	HF3A	HF4	HF4A	HF5	HF6
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	5.74	1.25	ND	2.48	ND
Beryllium	0.347	ND	0.357	ND	0.364	0.392	ND	0.267	0.361	0.269
Cadmium	ND	**1.96**	ND	**1.41**	ND	ND	ND	ND	ND	ND
Chromium	51.7	393	96.7	800	57.9	129	198	188	57.4	39.9
Copper	16.2	242	30.1	139	36.4	120	78.6	24.4	69.7	34.1
Lead	42.2	**930**	87.4	**3,230**	54.1	385	243	52.8	99.8	92.9
Mercury	0.212	0.446	0.231	0.526	0.274	0.746	3.33	0.183	0.196	0.365
Nickel	11.6	34.1	20.9	44.3	15.1	23.6	28	17.3	30.9	13.1
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	50.2	476	84.1	570	79.8	866	331	125	141	83
TPH	**4,020**	**28,400**	179	**28,900**	157	**1,970**	**17,700**	206	**8,430**	**1,130**

ND - The compound was not detected.
Results in bold are above NJDEPs respective Soil Cleanup Standards

Compound	HF7	HF8	HF9	HF10	HF10A
Antimony	ND	ND	ND	ND	ND
Arsenic	1.51	ND	ND	ND	3.72
Beryllium	ND	0.476	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND
Chromium	148	186	217	123	113
Copper	70.2	30.1	82.7	48.2	44.4
Lead	ND	142	**852**	**447**	72.4
Mercury	0.792	0.258	0.414	0.271	0.0488
Nickel	19.8	28.2	23	17.5	77.3
Selenium	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND
Zinc	611	148	317	231	81
TPH	**1,310**	224	**3,400**	**8,570**	790

ND - The compound was not detected.
Results in bold are above NJDEPs respective Soil Cleanup Standards



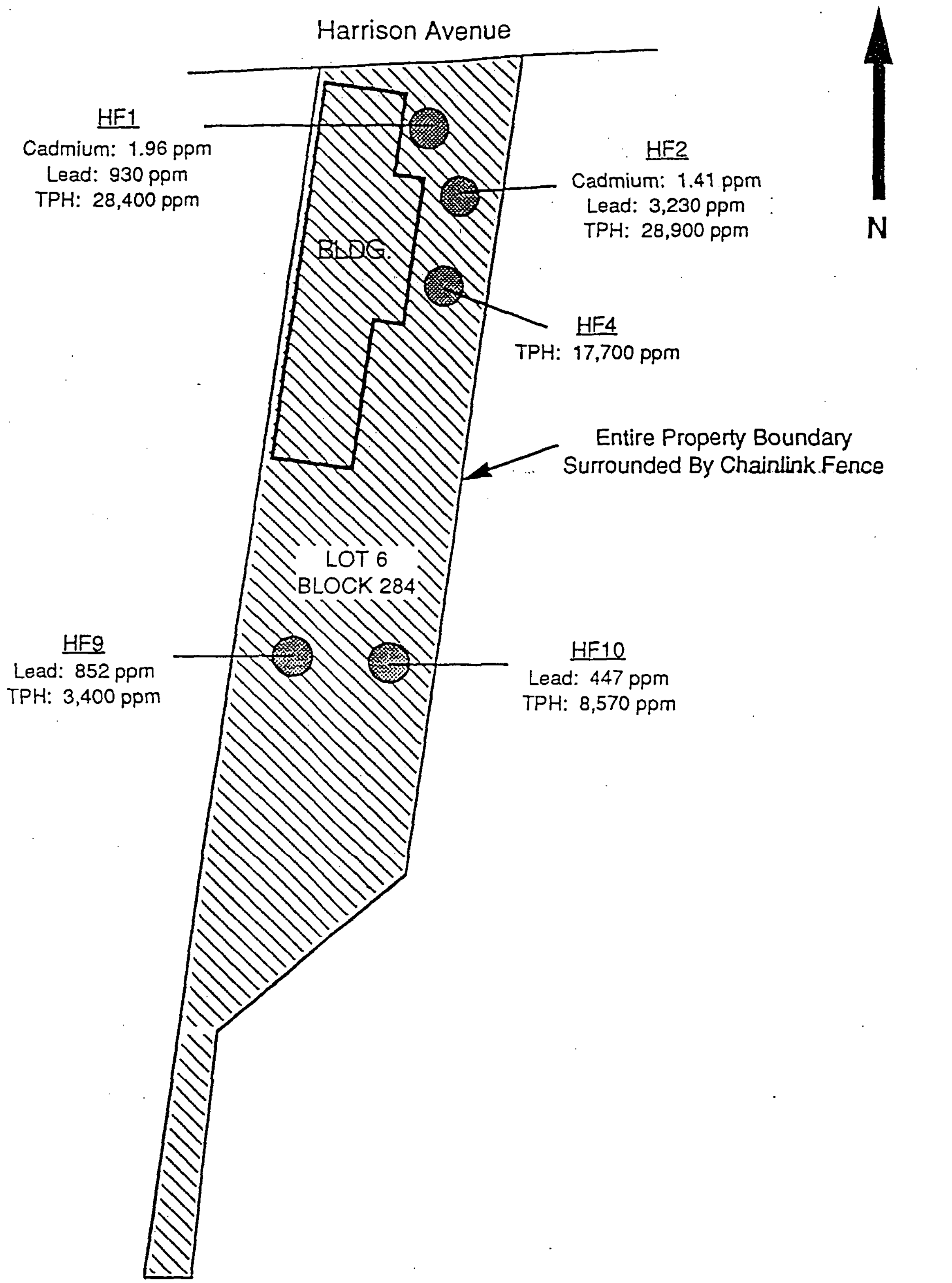
LEGEND

Area Covered By Concrete and DN

Central Salvage Co. 1221 Harrison Avenue Kearny, NJ	Prepared By: Lutz Environmental

GENERAL SITE PLAN

April 1998 SCALE: 1" = 100' Figure 1



LEGEND

- Area Covered By Concrete and DN
- Areas of Highest Soil Contamination

Central Salvage Co.
1221 Harrison Avenue
Kearny, NJ

Prepared By:
Lutz Environmental

MAP DETAILING AREAS OF HIGHEST SOIL CONTAMINATION

April 1998 SCALE: 1" = 100' Figure 2

REMEDIAL INVESTIGATION WORKPLAN

Former Central Salvage Company
1221 Harrison Avenue
Kearny, Hudson County, NJ
NJDEP Case #97-01-28-0847-35
UST #0316848

JANUARY 1998

Prepared For:
National Freight, Inc.
71 West Park Avenue
Vineland, NJ 08360

Prepared By:
Lutz Environmental Company, Inc.
2020 Clinton Street
Linden, NJ

Steven Papatrefon

Steven Papatrefon
Project Manager/Environmental Scientist
License # 0011782

TABLE 2

GROUNDWATER SAMPLE ANALYTICAL RESULTS
PRIORITY POLLUTANT METALS ANALYSIS
April 9, 1998
Concentrations in PPB

Parameter	Sample MW3	Sample MW9	Sample MW10
Antimony	ND	-	NA
Arsenic	**42.3**	-	NA
Beryllium	ND	-	NA
Cadmium	ND	-	NA
Chromium	**467**	-	NA
Copper	153	-	NA
Lead	**586**	-	**200**
Mercury	1.50	-	NA
Nickel	100	-	NA
Selenium	ND	-	NA
Silver	ND	-	NA
Thallium	ND	-	NA
Zinc	625	-	NA

ND - Not detected
Results in bold are above NJDEPs respective Groundwater Cleanup Standards

The depths to groundwater that were measured during this sampling event and the subsequently calculated groundwater elevations are presented in Table 3.

The results of the PP Metals analyses indicated very high concentrations of arsenic, cadmium, chromium, copper, lead , mercury, nickel and zinc in virtually every sample as summarized in Table 4. The very high concentrations of these metals are believed to be due to the fact that the samples were unfiltered.

TABLE 4

GRAB WATER SAMPLE ANALYTICAL RESULTS
PRIORITY POLLUTANT METALS ANALYSIS
July 17, 1997
(Concentrations in PPB)

Parameter	Sample GW1	Sample GW2	Sample GW3	Sample GW4	Sample GW10
Antimony	ND	ND	ND	ND	ND
Arsenic	**29.6**	**123**	**860**	**218**	**493**
Beryllium	ND	ND	18.5	18.5	5.69
Cadmium	ND	ND	**84.4**	**43.3**	**26.5**
Chromium	**237**	97.6	**7,770**	**9,330**	**266**
Copper	159	353	**4,290**	**2,210**	**1,700**
Lead	**1,780**	**1,610**	**17,800**	**9,840**	**5,320**
Mercury	**3.11**	**6.62**	**56.8**	**51.9**	**17.7**
Nickel	ND	58.4	**829**	**388**	**309**
Selenium	ND	ND	ND	ND	ND
Silver	ND	ND	41.6	22.6	ND
Thallium	ND	ND	ND	ND	ND
Zinc	605	852	**16,400**	**8,490**	**7,320**

ND - Not detected
Results in bold are above NJDEPs respective Groundwater Cleanup Standards

TABLE 6

SUMMARY OF GROUNDWATER ELEVATIONS (in feet)
April 23, 1998

	MW-2	MW-3	MW-4	MW-5	MW-9	MW-10
Elevation of Top of Well Screen	5.76'	5.71'	5.83'	3.60'	5.13'	5.60'
Elevation of Top of PVC Casing	7.76'	7.71'	7.83'	6.10'	7.63'	8.10'
Depth to Groundwater	2.87'	2.74'	3.32'	1.84'	2.48'	3.09'
Groundwater Elevation	4.89'	4.97'	4.51'	4.26'	5.15'	5.01'

The survey data presented in Table 6 was utilized to prepare a Groundwater Contour Map (Figure 5). Based on this data, the groundwater flow direction is towards the west. This is consistent with the previously determined groundwater flow direction.

c. Aquifer Characteristics Tests

In order to determine values of hydraulic conductivity, transmissivity and average rate of groundwater migration at the former Central Salvage property, five slug tests were performed on April 13, 1998. Rising head slug tests were performed on wells MW1, MW4 - 6 and MW8.

The slug test procedure involved the rapid submergence of a solid (26" x 3.25") PVC cylinder into the well in order to initiate an instantaneous rise of hydraulic head. In doing so, an unstable hydraulic head was created which may be monitored to establish a subsequent rate of fall. A pressure transducer placed at the bottom of the well recorded rate-of-fall measurements of groundwater. The rate was recorded consistent with a Standard Logrithmic Schedule:

TABLE 7

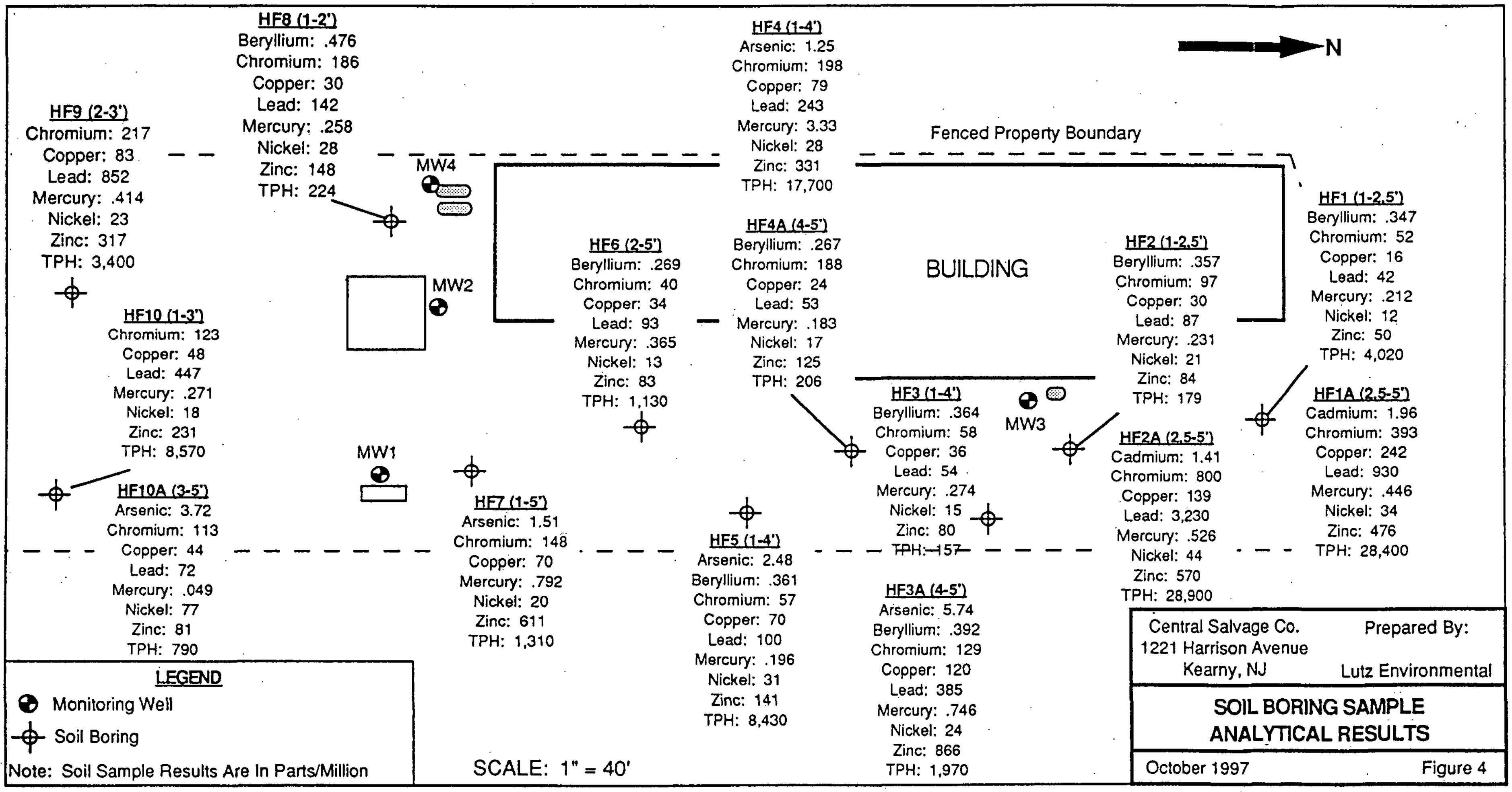
GROUNDWATER SAMPLE ANALYTICAL RESULTS
PRIORITY POLLUTANT METALS ANALYSIS
December 4, 1997
Concentrations in PPB

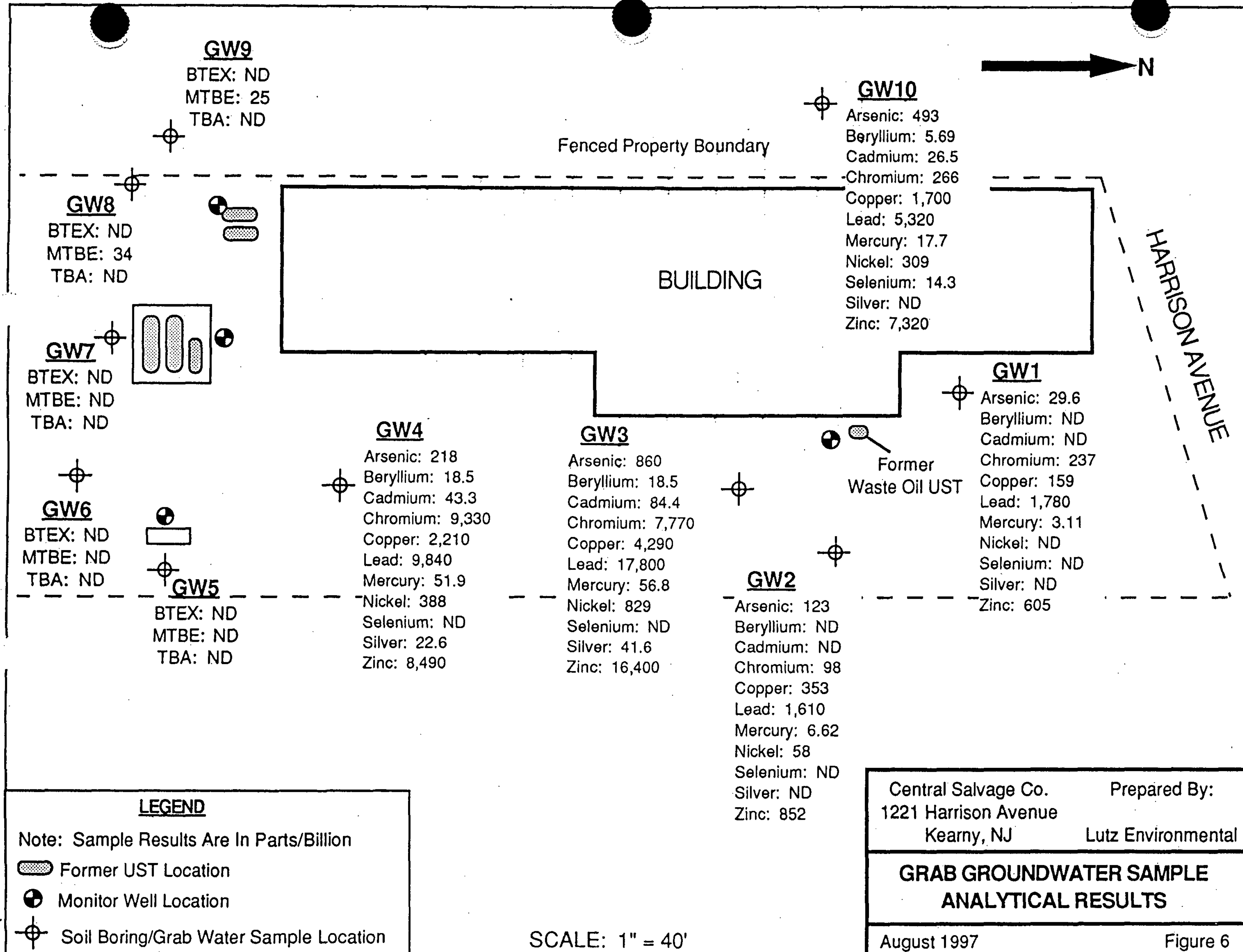
Parameter	Sample MW3	Sample MW9	Sample MW10
Antimony	ND	ND	ND
Arsenic	**31.5**	ND	ND
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	36.2	ND	53.3
Copper	13.5	ND	39.3
Lead	**59**	**25.1**	**350**
Mercury	0.16	ND	1.1
Nickel	10.4	ND	ND
Selenium	ND	13.8	8.5
Silver	ND	ND	ND
Thallium	ND	ND	ND
Zinc	93.4	48.3	184

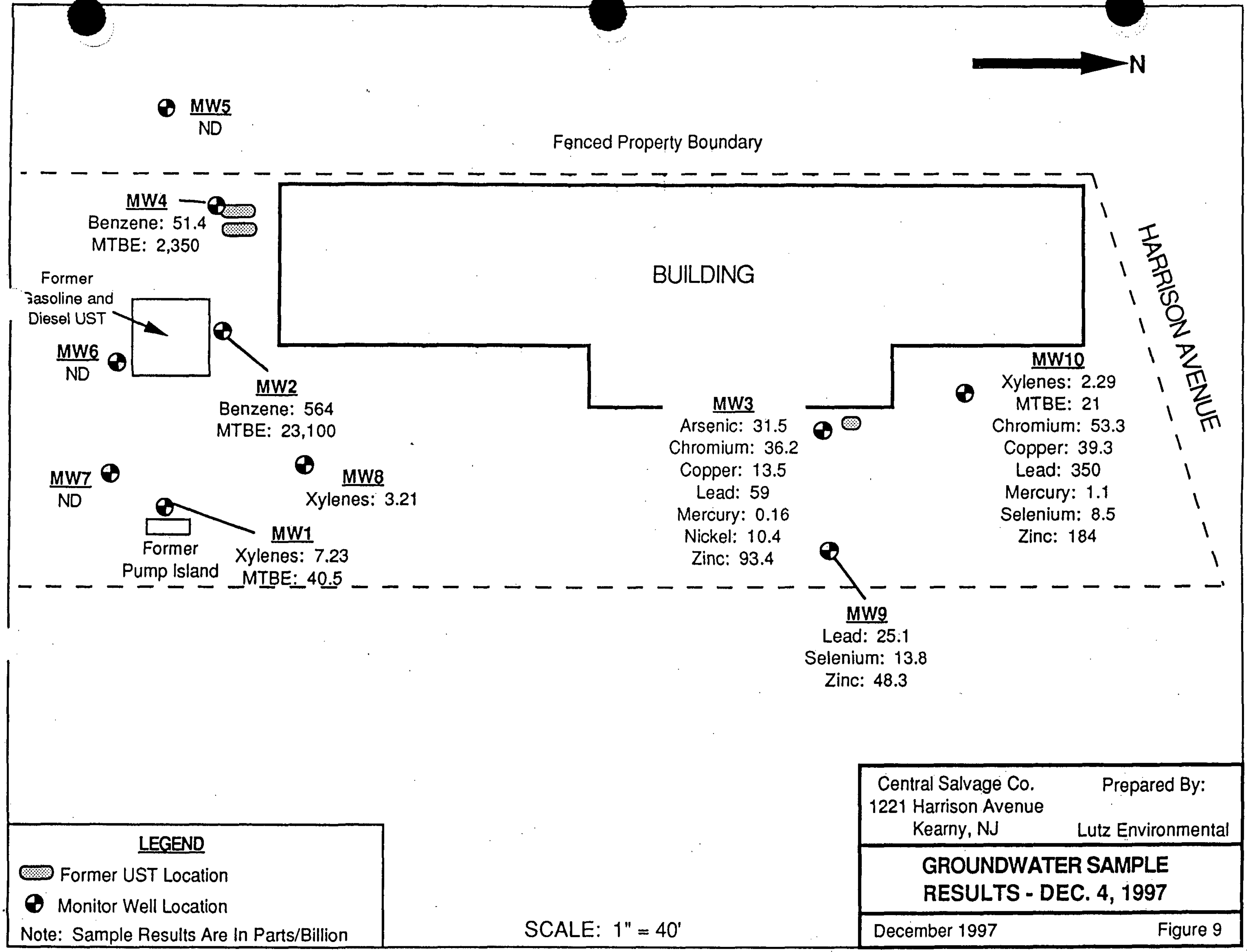
ND - Not detected
Results in bold are above NJDEPs respective Groundwater Cleanup Standards

It should be noted that the concentrations of all priority pollutant metals detected in these groundwater samples are significantly lower than in the unfiltered grab samples originally collected. This gives more evidence that the priority pollutant metal contamination is originating from the fill material at the site.

The base/neutral compounds analysis indicated trace concentrations of various base/neutrals as shown in Table 8. No base/neutral compounds were detected at concentrations above their respective NJDEP Groundwater Cleanup Standards.


N
Fenced Property Boundary
BUILDING
HF8 (1-2')
Beryllium: .476
Chromium: 186
Copper: 30
Lead: 142
Mercury: .258
Nickel: 28
Zinc: 148
TPH: 224
HF9 (2-3')
Chromium: 217
Copper: 83
Lead: 852
Mercury: .414
Nickel: 23
Zinc: 317
TPH: 3,400
HF4 (1-4')
Arsenic: 1.25
Chromium: 198
Copper: 79
Lead: 243
Mercury: 3.33
Nickel: 28
Zinc: 331
TPH: 17,700
MW4
MW2
MW1
MW3
HF10 (1-3')
Chromium: 123
Copper: 48
Lead: 447
Mercury: .271
Nickel: 18
Zinc: 231
TPH: 8,570
HF6 (2-5')
Beryllium: .269
Chromium: 40
Copper: 34
Lead: 93
Mercury: .365
Nickel: 13
Zinc: 83
TPH: 1,130
HF4A (4-5')
Beryllium: .267
Chromium: 188
Copper: 24
Lead: 53
Mercury: .183
Nickel: 17
Zinc: 125
TPH: 206
HF2 (1-2.5')
Beryllium: .357
Chromium: 97
Copper: 30
Lead: 87
Mercury: .231
Nickel: 21
Zinc: 84
TPH: 179
HF1 (1-2.5')
Beryllium: .347
Chromium: 52
Copper: 16
Lead: 42
Mercury: .212
Nickel: 12
Zinc: 50
TPH: 4,020
HF3 (1-4')
Beryllium: .364
Chromium: 58
Copper: 36
Lead: 54
Mercury: .274
Nickel: 15
Zinc: 80
TPH: 157
HF1A (2.5-5')
Cadmium: 1.96
Chromium: 393
Copper: 242
Lead: 930
Mercury: .446
Nickel: 34
Zinc: 476
TPH: 28,400
HF2A (2.5-5')
Cadmium: 1.41
Chromium: 800
Copper: 139
Lead: 3,230
Mercury: .526
Nickel: 44
Zinc: 570
TPH: 28,900
HF10A (3-5')
Arsenic: 3.72
Chromium: 113
Copper: 44
Lead: 72
Mercury: .049
Nickel: 77
Zinc: 81
TPH: 790
HF7 (1-5')
Arsenic: 1.51
Chromium: 148
Copper: 70
Mercury: .792
Nickel: 20
Zinc: 611
TPH: 1,310
HF5 (1-4')
Arsenic: 2.48
Beryllium: .361
Chromium: 57
Copper: 70
Lead: 100
Mercury: .196
Nickel: 31
Zinc: 141
TPH: 8,430
HF3A (4-5')
Arsenic: 5.74
Beryllium: .392
Chromium: 129
Copper: 120
Lead: 385
Mercury: .746
Nickel: 24
Zinc: 866
TPH: 1,970
LEGEND
Monitoring Well
Soil Boring
Note: Soil Sample Results Are In Parts/Million
SCALE: 1" = 40'
Central Salvage Co.
1221 Harrison Avenue
Kearny, NJ
Prepared By:
Lutz Environmental
SOIL BORING SAMPLE
ANALYTICAL RESULTS
October 1997
Figure 4


GW9
BTEX: ND
MTBE: 25
TBA: ND
N
GW10
Arsenic: 493
Beryllium: 5.69
Cadmium: 26.5
Chromium: 266
Copper: 1,700
Lead: 5,320
Mercury: 17.7
Nickel: 309
Selenium: 14.3
Silver: ND
Zinc: 7,320
Fenced Property Boundary
GW8
BTEX: ND
MTBE: 34
TBA: ND
BUILDING
HARRISON AVENUE
GW7
BTEX: ND
MTBE: ND
TBA: ND
GW1
Arsenic: 29.6
Beryllium: ND
Cadmium: ND
Chromium: 237
Copper: 159
Lead: 1,780
Mercury: 3.11
Nickel: ND
Selenium: ND
Silver: ND
Zinc: 605
GW4
Arsenic: 218
Beryllium: 18.5
Cadmium: 43.3
Chromium: 9,330
Copper: 2,210
Lead: 9,840
Mercury: 51.9
Nickel: 388
Selenium: ND
Silver: 22.6
Zinc: 8,490
GW3
Arsenic: 860
Beryllium: 18.5
Cadmium: 84.4
Chromium: 7,770
Copper: 4,290
Lead: 17,800
Mercury: 56.8
Nickel: 829
Selenium: ND
Silver: 41.6
Zinc: 16,400
Former
Waste Oil UST
GW6
BTEX: ND
MTBE: ND
TBA: ND
GW5
BTEX: ND
MTBE: ND
TBA: ND
GW2
Arsenic: 123
Beryllium: ND
Cadmium: ND
Chromium: 98
Copper: 353
Lead: 1,610
Mercury: 6.62
Nickel: 58
Selenium: ND
Silver: ND
Zinc: 852
LEGEND
Note: Sample Results Are In Parts/Billion
Former UST Location
Monitor Well Location
Soil Boring/Grab Water Sample Location
SCALE: 1" = 40'
Central Salvage Co.
1221 Harrison Avenue
Kearny, NJ
Prepared By:
Lutz Environmental
GRAB GROUNDWATER SAMPLE
ANALYTICAL RESULTS
August 1997
Figure 6


N
MW5
ND
Fenced Property Boundary
MW4
Benzene: 51.4
MTBE: 2,350
BUILDING
HARRISON AVENUE
Former
asoline and
Diesel UST
MW6
ND
MW2
Benzene: 564
MTBE: 23,100
MW3
Arsenic: 31.5
Chromium: 36.2
Copper: 13.5
Lead: 59
Mercury: 0.16
Nickel: 10.4
Zinc: 93.4
MW10
Xylenes: 2.29
MTBE: 21
Chromium: 53.3
Copper: 39.3
Lead: 350
Mercury: 1.1
Selenium: 8.5
Zinc: 184
MW7
ND
MW8
Xylenes: 3.21
MW1
Xylenes: 7.23
MTBE: 40.5
Former
Pump Island
MW9
Lead: 25.1
Selenium: 13.8
Zinc: 48.3
LEGEND
Former UST Location
Monitor Well Location
Note: Sample Results Are In Parts/Billion
SCALE: 1" = 40'
Central Salvage Co.
1221 Harrison Avenue
Kearny, NJ
Prepared By:
Lutz Environmental
GROUNDWATER SAMPLE
RESULTS - DEC. 4, 1997
December 1997
Figure 9

Log Cycle	Elapsed Time	Sample Interval
1	0-20 sec.	0.5 sec.
2	20-60 sec.	1 sec.
3	1-10 min.	12 sec.
4	10-100 min.	2 min.
5	100-1,000 min.	20 min.
6	1,000-10,000 min.	200 min.
7	> 10,000 min.	1,440 min.

The hydraulic head versus time data obtained for the wells was plotted and then approximated a linear slope for the rate of fall (See Appendix III). As early time response may be influenced by the presence of the filter pack surrounding the casing screen, the early-time data (approximately Log Cycle 1) were ignored if they differed from data for the later period. The hydraulic conductivity value (K) was computed using the formula of Hvorslev (1951):

$$K = \frac{d^2 \ln (2L/D) \times L (H_1/H_2)}{8L(t_2-t_1)}$$

where:
d - well casing diameter
D - diameter of borehole
L - length of saturated screened interval or open hole
T - time
H_1/H_2 - Hydraulic head for $t=t_1$ and $t=t_2$

The computed hydraulic conductivity (K) values for the site area as follows:

MW1 = 1.09×10^{-2} cm/sec.
MW4 = 7.47×10^{-3} cm/sec.
MW5 = 2.60×10^{-2} cm/sec.
MW6 = 5.97×10^{-4} cm/sec.
MW8 = 2.14×10^{-2} cm/sec.

To obtain a representative hydraulic conductivity value for the above wells, the **geometric** mean procedure was employed. This was determined by finding the mean for the natural logs of (K) and then obtaining the exponential (e^x) of that mean value. The geometric mean of K values from the five tests is 7.69 x 10^{-3} cm/sec or 21.8 feet/day.

The average linear velocity of groundwater flow in a water-bearing unit is important in considerations of groundwater and potential contaminant migration. The average linear velocity of groundwater flow (V_L) is estimated from the following Darcy formula (Fetter, 1998):

$$VL = (Ki)/n_e$$

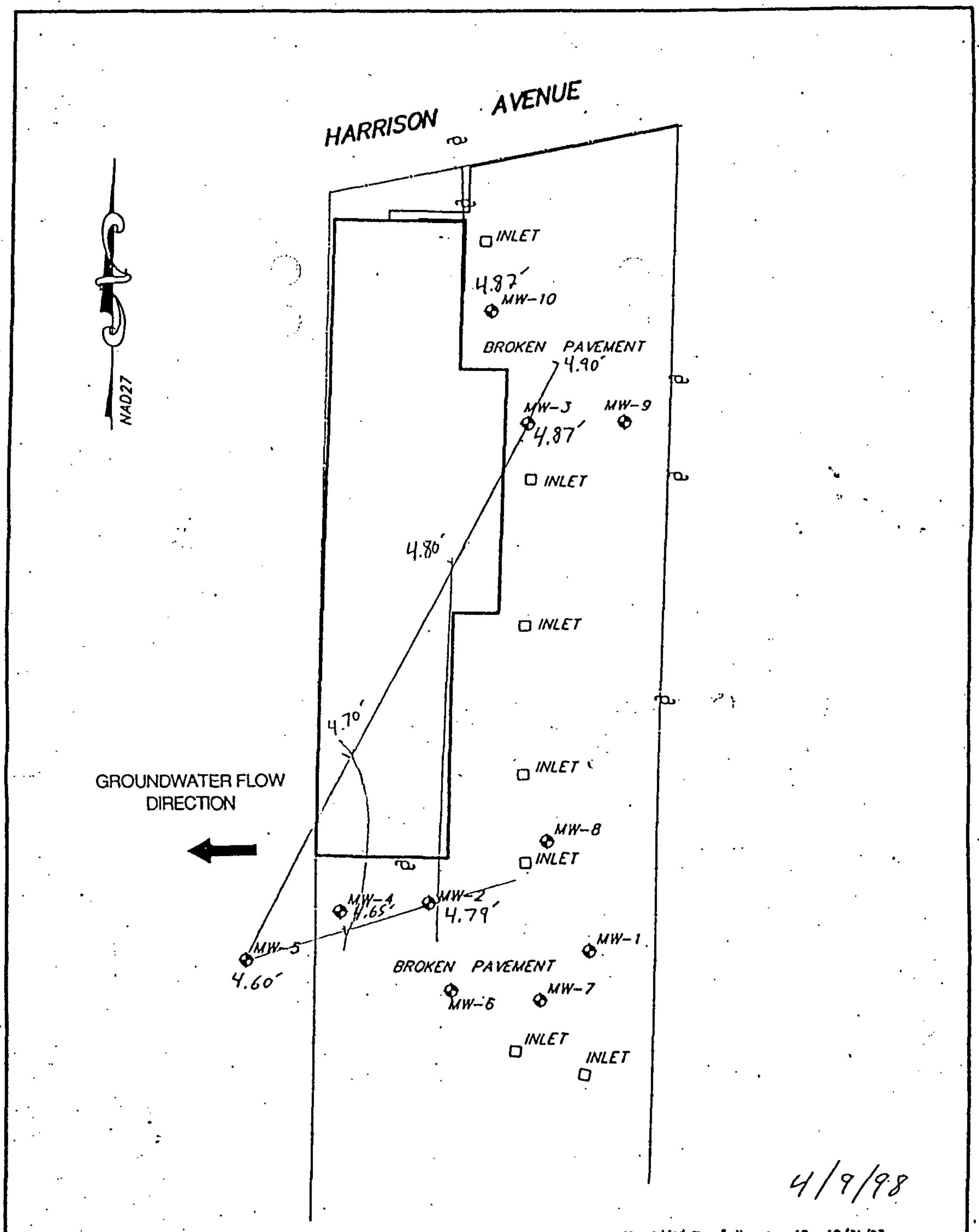
where:
K = avg. value of hydraulic conductivity. From slug tests, k= 21.8 ft/day
i = avg. hydraulic gradient based on survey elevations, i - 0.003.
n_e = Effective porosity value, estimated to be 0.25 (Freeze and Cherry, 1979)

<u>Using the above values of hydraulic parameters, the average linear velocity of groundwater at the site was computed at approximately 0.26 feet/day or 95.5 feet/year.</u>

All slug test data and graphs are included in Appendix III.

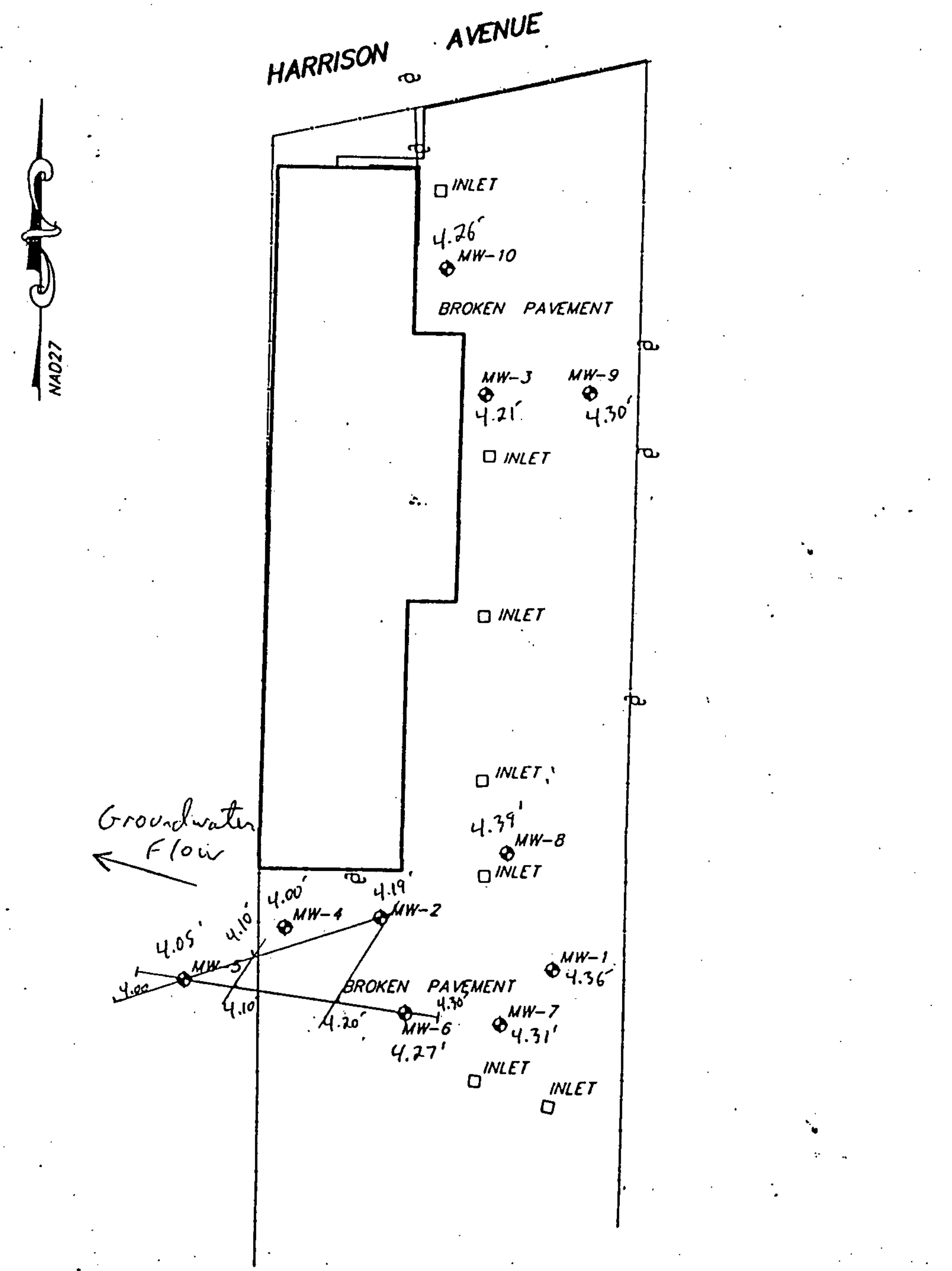
d. Classification Exception Area

In order to establish a Classification Exception Area (CEA) for this site, the extent of the contaminant plume and the duration of the contaminant with the longest half life needed to be calculated. Using the NJDEPs Classification Exception Area Guidance Document, both of these figures were calculated.



rev. added mw-5 thru mw-10 10/31/97

WELL LOCATION PLAN CENTRAL SALVAGE COMPANY TOWN OF KEARNEY HUDSON COUNTY NEW JERSEY	DHS SINCE 1955	**DONALD H. STIRES ASSOCIATES** Engineers • Planners • Surveyors 43 WEST HIGH STREET SOMERVILLE, N.J. 08876 PHONE (908)725-0230 FAX (908)707-0831
RICHARD C. MATHEWS PROFESSIONAL LAND SURVEYOR *Richard C Mathews*	N.J. LICENSE No. 29353 DATE 4/28/97	SCALE: 1" = 50' SHEET NUMBER 1 OF 1
PROJECT No. 97060	DRAWN BY: RCM	CHECKED BY: R.C.M.



rev. added mw-5 thru mw-10 10/31/97

WELL LOCATION PLAN
CENTRAL SALVAGE COMPANY
TOWN OF KEARNEY HUDSON COUNTY
NEW JERSEY

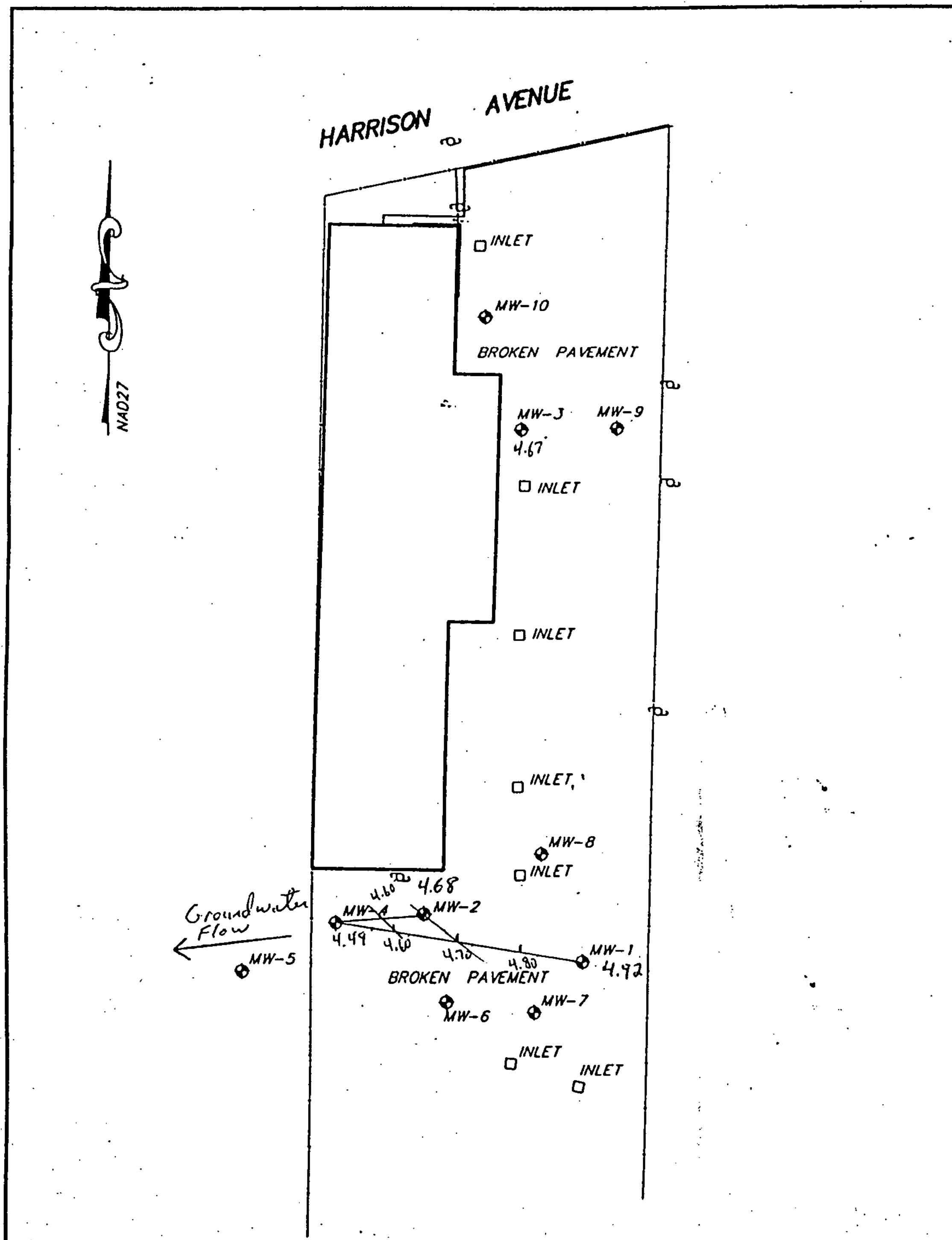
SINCE 1955

DONALD H. STIRES ASSOCIATES
Engineers • Planners • Surveyors
43 WEST HIGH STREET SOMERVILLE, N.J. 08876
PHONE (908)725-0230 FAX (908)707-0831

RICHARD C. MATHEWS
PROFESSIONAL LAND SURVEYOR
N.J. LICENSE No. 29353
DATE 4/29/97

SCALE: 1" = 50'
SHEET NUMBER 1 OF 1

PROJECT No. 97060 | DRAWN BY: RCM | CHECKED BY: R.C.M.



rev. added mw-5 thru mw-10 10/31/97

WELL LOCATION PLAN

CENTRAL SALVAGE COMPANY

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NEW JERSEY

DHS SINCE 1955

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RICHARD C. MATHEWS

PROFESSIONAL LAND SURVEYOR

Richard C. Mathews

N.J. LICENSE No. 29353

DATE 4/23/97

SCALE: 1" = 50'

SHEET NUMBER

1 OF 1

PROJECT No. 97060

DRAWN BY: RCM

CHECKED BY: R.C.M.

Z ENVIFONMENTAL CO., INC.
20 CLINTON STREET · LINDEN, NEW JERSEY 07036 · (908)862-8888

BORING LOG:

NO. MW 5 COORDINATE NO. 26 12 969 PERMIT NO. 26 48854

DATE DRILLED 10-2-97 COUNTY HUDSON USE MONITOR

LOCATION CENTRAL SALVAGE CO. 1221 HARRISON AVE. KEARNY NJ.

OWNER NATIONAL FREIGHT INC. ADDRESS 71 WEST PARK VINELAND, NJ.

DRILLING METHOD AIR ROTARY SAMPLING METHOD COMPOSITE

HOLE DIA. 8" TOTAL DEPTH 10'

CASING:

TYPE MONOFLEX PVC SLOT — DIA 4" LENGTH 2.5'

SCREEN:

TYPE MONO FLEX PVC SLOT .020 DIA 4" LENGTH 7.5'

GRAVEL PACK SIZE #1 WELL GRAVEL CASING SEAL CEMENT

STATIC WATER LEVEL APPROX 4.5' GEOLOGIC FORMATION UNCONSOLIDATED

DEPTH BELOW SURFACE	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	IDENTIFICATION OF SOILS/REMARKS
		20 S800 ZS.	2.5 SOLID / 7.5 - SCREEN (.020)	12" STEEL MANHOLE SET IN CONCRETE.
				0'-1.5' — CONCRETE AND ASPHALT
				1.5'-4.0' — "BACKFILL." Red Bricks, BLACK SILTY SANDS AND SLAG.
				4.0'-10.0 — Red / BROWN SANDS SILTS AND GRAVEL.
				H2O APPROX. 4.5
				SET WELL @ 10'

TZ ENVIRONMENTAL CO., INC.
J20 CLINTON STREET · LINDEN, NEW JERSEY 07036 · (908)862-8888

BORING LOG:

NO. MW - 6 COORDINATE NO. 26 12 96 9 PERMIT NO. 26-48855

DRILLED: 10-2-97 COUNTY HUDSON USE MONITOR

LOCATION CENTRAL SALVAGE CO. 1221 HARRISON AVE. KEARNY NJ.

OWNER NATIONAL FREIGHT INC. ADDRESS 71 WEST PARK VINELAND, NJ.

DRILLING METHOD AIR ROTARY SAMPLING METHOD COMPOSITE

HOLE DIA. 8" TOTAL DEPTH 10'

CASING:

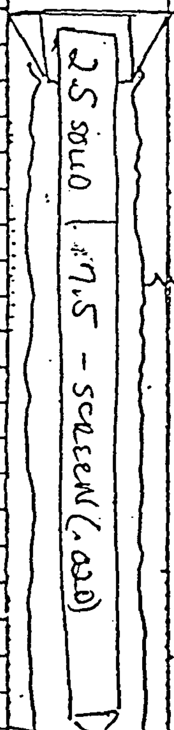
TYPE MONO FLEX PVC SLOT — DIA. 4" LENGTH 2.5'

SCREEN:

TYPE MONO FLEX PVC SLOT .020 DIA. 4" LENGTH 7.5'

GRAVEL PACK SIZE #1 WELL GRAVEL CASING SEAL CEMENT

STATIC WATER LEVEL APPROX 4.5' GEOLOGIC FORMATION UNCONSOLIDATED

DEPTH BELOW SURFACE	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	IDENTIFICATION OF SOILS/REMARKS
		NO SPOONS		12" STEEL MANHOLE SET IN CONCRETE. 0'-1.5' — CONCRETE AND ASPHALT 1.5'-4.0' — "BACKFILL." Red Bricks, BLACK SILTY SANDS AND SLAG. 4.0'-10.0' — Red/Brown SANDS SILTS AND GRAVEL. H2O APPROX. 4.5 SET WELL @ 10'

...TZ ENVIRONMENTAL CO., INC.

2020 CLINTON STREET · LINDEN, NEW JERSEY 07036 · (908)862-8888

BORING LOG:

WELL NO. MW 7 COORDINATE NO. 26-12969 PERMIT NO. 26-48856

DATE DRILLED 10-2-97 COUNTY HUDSON USE MONITOR

LOCATION CENTRAL SALVAGE CO. 1221 HARRISON AVE KEARNY NJ

OWNER NATIONAL FREIGHT INC. ADDRESS 71 WEST PARK VINELAND, NJ.

DRILLING METHOD AIR ROTARY SAMPLING METHOD COMPOSITE

HOLE DIA. 8" TOTAL DEPTH 10'

CASING:
TYPE MONO FLEX PVC SLOT — DIA 4" LENGTH 2.5'

SCREEN:
TYPE MONO FLEX PVC SLOT .020 DIA 4" LENGTH 7.5'

GRAVEL PACK SIZE #1 WELL GRAVEL CASING SEAL CEMENT

STATIC WATER LEVEL APPROX 4.5' GEOLOGIC FORMATION UNCONSOLIDATED

DEPTH BELOW SURFACE	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	IDENTIFICATION OF SOILS/REMARKS
		NO SPOONS	12" STEEL MANHOLE SET IN CONCRETE. 2.5 SOLID 7.5 - SCREEN (.020) H2O APPROX. 4.5	0'-1.5' — CONCRETE AND ASPHALT 1.5'-4.0' — "BACKFILL" Red Bricks, BLACK SILTY SANDS AND SLAG. 4.0'-10.0 — Red / BROWN SANDS SILTS AND GRAVEL. SET WELL @ 10'

Z ENVIRONMENTAL CO., INC.

CLINTON STREET · LINDEN, NEW JERSEY 07036 · (908)862-8888

LOG:

NO. MW 8 COORDINATE NO. 2612969 PERMIT NO. 26-48857

DATE DRILLED 10-2-97 COUNTY HUDSON USE MONITOR

LOCATION CENTRAL SALVAGE CO. 1221 HARRISON AVE KEARNY NJ.

OWNER NATIONAL FREIGHT INC. ADDRESS 71 WEST PARK VINELAND, NJ.

DRILLING METHOD AIR ROTARY SAMPLING METHOD COMPOSITE

HOLE DIA. 8" TOTAL DEPTH 10'

CASING:

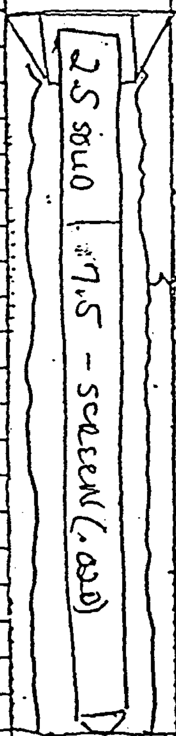
TYPE MONOFLEX PVC SLOT — DIA 4" LENGTH 2.5'

SCREEN:

TYPE MONO FLEX PVC SLOT .020 DIA 4" LENGTH 7.5'

GRAVEL PACK SIZE #1 WELL GRAVEL CASING SEAL CEMENT

STATIC WATER LEVEL APPROX 4.5' GEOLOGIC FORMATION UNCONSOLIDATED

DEPTH BELOW SURFACE	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	IDENTIFICATION OF SOILS/REMARKS
		NO SPOONS.		12" STEEL MANHOLE SET IN CONCRETE.
				0'-1.5' — CONCRETE AND ASPHALT
				1.5'-4.0' — "BACKFILL." Red Bricks, BLACK SILTY SANDS AND SLAG.
				4.0'-10.0' — Red/Brown SANDS SILTS AND GRAVEL.
				H2O - APPROX. 4.5
				SET WELL @ 10'

TZ ENVIRONMENTAL CO., INC.
20 CLINTON STREET · LINDEN, NEW JERSEY 07036 · (908)862-8888

BORING LOG:

NO. MW 9 COORDINATE NO. 26 12 969 PERMIT NO. 26 48858

DRILLED: 10-2-97 COUNTY HUDSON USE MONITOR

LOCATION CENTRAL SALVAGE CO. 1221 HARRISON AVE KEARNY NJ.

OWNER NATIONAL FREIGHT INC. ADDRESS 71 WEST PARK VINELAND, NJ.

DRILLING METHOD AIR ROTARY SAMPLING METHOD COMPOSITE

HOLE DIA 8"

CASING: TOTAL DEPTH 10'

TYPE MONO FLEX PVC SLOT — DIA 4" LENGTH 2.5'

SCREEN:

TYPE MONO FLEX PVC SLOT .020 DIA 4" LENGTH 7.5'

GRAVEL PACK SIZE #1 WELL GRAVEL CASING SEAL CEMENT

STATIC WATER LEVEL APPROX 4.5' GEOLOGIC FORMATION UNCONSOLIDATED

DEPTH BELOW SURFACE	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	IDENTIFICATION OF SOILS/REMARKS
		20 S 000 Z S	12" STEEL MANHOLE SET IN CONCRETE. 2.5 SOLID; 7.5 - SCREEN (.020)	0'-1.5' — CONCRETE AND ASPHALT 1.5'-4.0' — "BACKFILL" Red Bricks, BLACK SILTY SANDS AND SLAG. 4.0'-10.0' — Red/Brown SANDS SILTS AND GRAVEL. H2O APPROX. 4.5 SET WELL @ 10'

Z ENVIFONMENTAL ˘O., INC.

ƐLINTON STREET · LINDEN, NEW JERSEY 07036 · (908)862-8888

...G: MW 10	COORDINATE NO. 2612969 PERMIT NO. 2648859
...RILLED: 10-2-97	COUNTY HUDSON USE MONITOR
...TION: CENTRAL SALVAGE CO. 1221 HARRISON AVE KEARNY NJ.	
...NER: NATIONAL FREIGHT INC.	ADDRESS 71 WEST PARK VINELAND, NJ.
...ILLING METHOD: AIR ROTARY	SAMPLING METHOD: COMPOSITE
...OLE DIA.: 8"	TOTAL DEPTH: 10'
...ASING: TYPE: MONO FLEX PVC	SLOT — DIA 4" LENGTH 2.5'
...CREEN: TYPE: MONO FLEX PVC	SLOT .020 DIA. 4" LENGTH 7.5'
...RAVEL PACK SIZE: #1 WELL GRAVEL	CASING SEAL: CEMENT
...TATIC WATER LEVEL: APPROX 4.5'	GEOLOGIC FORMATION: UNCONSOLIDATED

DEPTH BELOW SURFACE	SAMPLE NUMBER	BLOWS PER 6" ON SAMPLER	WELL DESIGN	12" STEEL MANHOLE SET IN CONCRETE. IDENTIFICATION OF SOILS/REMARKS
		NO SPOONS.	2.5 SOLID 7.5 - SCREEN (.020) H2O APPROX. 4.5	0'-1.5' — CONCRETE AND ASPHALT 1.5'-4.0' — "BACKFILL." Red Bricks, BLACK SILTY SANDS AND SLAG. 4.0'-10.0' — Red/Brown SANDS SILTS AND GRAVEL. SET WELL @ 10'

Campbell Foundry

SAMPLING AND ANALYSIS
CAMPBELL FOUNDRY COMPANY
WASTE MANAGEMENT AREA
KEARNY, NEW JERSEY

Prepared for

STATE OF NEW JERSEY
Trenton, New Jersey

Prepared by

HATCHER-SAYRE, INC.
Richmond, Virginia

Project: 0002-001

September, 1989

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SAMPLING AND ANALYSIS
CAMPBELL FOUNDRY COMPANY
WASTE MANAGEMENT AREA
KEARNY, NEW JERSEY

BACKGROUND

Campbell Foundry has been in operation since 1921. The foundry manufactures gray iron municipal castings by the mold casting method. The wastes produced at the foundry are primarily silica sand, bentonite and molten rock. Additionally, a small quantity of Cupola emission control dust was generated between 1975 and 1981. All of the above mentioned wastes were stockpiled on the subject site in the period from 1965 to 1981 and were used for construction fill elsewhere for at least the past 30 years. At present the site is used for storage of iron castings. Topography is flat, but slopes abruptly downward along the south side of the property where the fill extends into marsh land adjacent to the Interstate 280 right-of-way. The approximate location of the Manufacturing Plant and the Kearny Yard are shown by the vicinity map on the plan sheet in Appendix I.

PURPOSE

This study was conducted in response to requirements of the New Jersey Department of Environmental Protection to determine if the Kearny Yard is in compliance with Federal RCRA regulations. Specifically, 40 CFR & 265.1 (b) requires all TSD facilities to meet minimum standards until certification of final closure. This study was specifically designed to sample and analyze the remaining waste material and natural soils to determine if cadmium and lead concentrations exceed the levels of these two metals occurring in nearby surface soils not subjected to cupola bag house dust storage activity.

SAMPLING AND ANALYSIS

Sampling was conducted at 18 boring locations as shown by the plan in Appendix I. Sampling locations were initially established on two, 200-foot square grid systems. The node locations of borings were determined based on a random process using the Hewlett-Packard 32S random number generator function. The plan boring locations were subsequently modified per the direction of the New Jersey Department of Environmental Protection. The borings were located in the field by reference to grid lines established by surveying methods prior to the time of sampling.

Each boring was sampled continuously on 24-inch intervals with a standard split-spoon sampler (ASTM D 1586). Sampling extended to depths of 6 to 10 feet as necessary to penetrate the surfical fill. Decontamination procedures were in accordance with the standards outlined by the New Jersey Department of Environmental Protection. Specifically field cleaning of all sampling spoons and utensils followed a five step method as follows:

A. Phosphate detergent plus tap water wash.
B. Tap water rinse.
C. Distilled/deionized water rinse.
D. 10 percent nitric acid rinse.
E. Distilled/deionized water rinse.

Samples were transferred from the spoon sampler to laboratory certified (I-CHEM) containers using a stainless steel utensil. Field blanks were performed at a rate 1 per day, per matrix and were analyzed for the same parameters as the soil samples. Following the completion of each boring, the auger flights were steam cleaned or scrubbed with Alconox detergent and tap water. Upon completion of field sampling, all of the borings were backfilled with grout. Boring logs depicting fill thicknesses and visual soil descriptions are included in Appendix I.

Following the completion of each boring, one sample of the fill was selected for laboratory analysis by means of the Hewlett-Packard random number generator; three samples of the underlying natural soils were similarly selected for analysis. In addition to the above, surface specimens were obtained from 5 locations along Harrison Avenue. All of those samples were analyzed to provide background data for comparison with site soils.

Samples were transported daily to a laboratory which is certified in the state of New Jersey. The selected samples were tested using the priority pollutant metals scan for lead and cadmium. Laboratory methods specified are in accordance with those approved by the U.S. Environmental Protection Agency. Laboratory test results are summarized on the data sheets in Appendix II.

SUBSURFACE CONDITIONS

Subsurface conditions consist of three to eight feet of fill which typically is composed of black variably clayey sand. The fill contains some crushed stone and debris, such as glass, wood, plastic, and slag. Within the northern most sampling grid, the upper six to eight inches of the profile is typically composed of crushed stone. At depths of three to eight feet, borings encountered natural soils which vary from black clay, sand and silt to sandy gravel. In general, the upper one to two feet of the natural soil profile consists of organic marsh deposits which grade downward to clay and organically stained sand. Groundwater levels were not recorded, but typically occur at depths of two to four feet below the existing ground surface.

TEST RESULTS AND FINDINGS

The borings encountered waste sand, clay and miscellaneous debris but did not reveal the presence of Cupola dust. Laboratory analytical results indicate that lead concentrations in the waste fill range from not detected to 2,650 ppm, averaging 441.5 ppm. Cadmium concentrations among the same samples range from not detected to 6.3 ppm, averaging 1.6 ppm. The 3 randomly selected natural ground specimens obtained from beneath the waste fill (G3-4, D6-4, F10-4) possess lead concentrations ranging from 37 to 511 ppm, averaging 201 ppm; cadmium was not detected in any of the same samples. The 5 background samples obtained along Harrison Avenue (BK1 through BK5) possess lead concentrations ranging from 15 to 1490 ppm averaging 775.6 ppm. Cadmium concentrations among the same samples range from not detected to 6 ppm, averaging 2.6 ppm.

While not in the sampling plan, we conducted a statistical comparison of the lead and cadmium values in the background soil samples vs. fill material in the Campbell storage yard. Specifically, we compared the means of the sample sets utilizing Cochran's approximation to the Behrens-Fisher students T-Test. Both lead and cadmium from the Campbell storage yard were statistically non-significant when compared to the background samples.

CONCLUSIONS

The lead and cadmium concentration in areas of the fill material sampled in the study are not significantly different from lead and cadmium concentrations in background samples collected on property adjacent to the site. The location of the storage yard has been subjected to constant atmospheric contamination from automobiles, trucks, and industrial emission since Campbell Foundry started storing wastes at that location. Therefore, the lead and cadmium values at the storage yard are probably typical for that region of New Jersey.

Campbell Foundry Co.
Kearny, NJ
Job No: 0002-001

SUMMARY OF ANALYTICAL TESTS

Boring	Sample No.	Depth (Ft.)	CADMIUM Result (MG/KG)	CADMIUM Reporting Limit	LEAD Result (MG/KG)	LEAD Reporting Limit
G3	1	0-2	ND	0.52	47.7	5.2
I2	1	0-2	6.3	0.58	13.2	5.8
B2	2	2-4	1.3	0.50	407	5.0
West 18	4	6-8	0.7	0.5	44	5
West 16	1	0-2	ND	0.5	71	5
N17	3	4-6	1.4	0.5	693	5
N21	1	0-2	ND	2	ND	25
S14	2	2-4	ND	2	25	20
T16	2	2-4	ND	1	72	10
S20	2	2-4	2	1	609	10
U21	1	0-2	ND	2	269	15
D9	2	2-4	10	2	2650	15
J9	1	0-2	ND	1	191	10
J5	1	0-2	3.4	0.5	1320	5
[illegible]	2	2-4	ND	0.5	134	5
[illegible]	2	2-4	ND	2	82	15
[illegible]7	2	2-4	4	2	1060	15
F10	2	2-4	ND	2	259	15
G3	4	6-8	ND	0.5	37	5
D6	4	6-8	ND	0.5	511	5
F10	4	6-8	ND	0.5	55	5
BK1	1	0.5	2	1	380	10
BK2	1	0.5	3	1	1040	10
BK3	1	0.5	ND	0.5	15	5
BK4	1	0.5	2.0	0.5	953	5
BK5	1	0.5	6	1	1490	10

ND-NOT DETECTED

REMEDIAL INVESTIGATION REPORT
CAMPBELL FOUNDRY KEARNY YARD

1235 Harrison Avenue
Kearny, Hudson County, New Jersey

PREPARED FOR:

Campbell Foundry Company
800 Bergen Street
Harrison, New Jersey 07029

PREPARED BY:

Hudson Environmental Services, Inc.
4 Mark Road, Suite C
Kenilworth, New Jersey 07033

December 1993

REMEDIAL INVESTIGATION REPORT
CAMPBELL FOUNDRY KEARNY YARD

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FIGURES

ATTACHMENTS

CAMPBELL FOUNDRY KEARNY YARD
REMEDIAL INVESTIGATION REPORT

1.0 *INTRODUCTION*

Campbell Foundry Kearny Yard ("CFKY") is located within an industrial zoned area at 1235 Harrison Ave., Kearny, New Jersey. Campbell Foundry Company used the Kearny Yard between 1927 to present primarily for the storage and shipping of iron castings. Between the years 1965 and 1981 Campbell Foundry stored waste cupola dust on the rear section of the Kearny Yard. Cupola dust is a dry waste product containing elevated concentrations of lead and cadmium and is classified as Hazardous Waste D006 and D008. All cupola dust was removed from the CFKY by the end of 1981.

Storage of waste cupola dust as a waste pile is listed as a hazardous waste activity S03. Although Campbell Foundry Company has ceased storing cupola dust at the CFKY and has removed all cupola dust from the CFKY, Campbell Foundry Company is still listed as a hazardous waste treatment,storage, and disposal facility due to elevated concentrations of lead and cadmium remaining in soil at the CFKY. By letter dated May 2, 1991 and May 21, 1991 Campbell Foundry requested to be delisted from treatment, storage, and disposal status to generator status only. By letter dated June 26, 1991 the Department delisted D80 activity but not the S03 activity pending remediation of lead and cadmium contaminated soil.

Campbell Foundry Company entered into a Memorandum of Agreement (MOA) with the Department on December 21, 1992 for the purpose of remediating lead and cadmium contaminated soil at the CFKY in accordance with NJDEPE cleanup criteria. Upon completion of remedial activities, Campbell Foundry's status as a storage facility will be delisted. The purpose of this report is to detail the TCLP lead and cadmium soil investigation conducted at the site on August 23, 1993 in accordance with the August 13, 1993 letter from Hudson Environmental Services, Inc. ("Hudson") to the Department. The purpose of the TCLP soil investigation was to determine if any areas of the CFKY contained leachable levels of lead and cadmium.

This report documents the work conducted by Hudson on behalf of Campbell Foundry Company to complete sampling proposed in the August 13, 1993 letter to the Department. This report discusses observations made during the collection of samples, and the location, number, type, depth, and frequency of samples obtained during sampling activities. Additionally, this report contains the sampling methodologies and the quality assurance and quality control ("QA/QC") procedures used in collecting and analyzing samples.

2.0 *TECHNICAL OVERVIEW*

2.1 Reliability Of Laboratory Analytical Data

Hudson Environmental Services has evaluated the laboratory deliverables prepared by Veritech laboratory. Laboratory reduced deliverables quality assurance and quality control data provided in Attachment 3, have been checked to insure they comply with the "Technical Requirements for Site Remediation". Samples were analyzed within holding times using proper analytical methods specified in the NJDEPE, May 1992, "Field Sampling Procedures Manual".

2.1.1 Handling and Holding Times

Soil samples collected August 23, 1993 were stored in Hudson's sample refrigerator at 4 degrees Celsius overnight until they were picked up and delivered to Veritech laboratory in a chilled cooler on August 24, 1993.

Campbell Foundry Co.
Kearny, NJ
Job No: 0002-001

TABLE 1

SUMMARY OF ANALYTICAL TESTS

100 ppm 3?1   600... 400

ring	Sample No.	Depth (Ft.)	CADMIUM Result (MG/KG)	CADMIUM Reporting Limit	LEAD Result (MG/KG)	LEAD Reporting Limit
	1	0-2	ND	0.52	47.7	5.2
	1	0-2	6.3	0.58	13.2	5.8
	2	2-4	1.3	0.50	407	5.0
st 18	4	6-8	0.7	0.5	44	5
st 16	1	0-2	ND	0.5	71	5
7	3	4-6	1.4	0.5	693	5
1	1	0-2	ND	2	ND	25
4	2	2-4	ND	2	25	20
6	2	2-4	ND	1	72	10
0	2	2-4	2	1	609	10
1	1	0-2	ND	2	269	15
	2	2-4	10	2	2650	15
	1	0-2	ND	1	191	10
	1	0-2	3.4	0.5	1320	5
	2	2-4	ND	0.5	134	5
	2	2-4	ND	2	82	15
	2	2-4	4	2	1060	15
0	2	2-4	ND	2	259	15
	4	6-8	ND	0.5	37	5
	4	6-8	ND	0.5	511	5
0	4	6-8	ND	0.5	55	5
1	1	0.5	2	1	380	10
2	1	0.5	3	1	1040	10
3	1	0.5	ND	0.5	15	5
4	1	0.5	2.0	0.5	953	5
5	1	0.5	6	1	1490	10

-NOT DETECTED

SAMPLING DATE: August 1, 1989

TABLE 2

AUGUST 23, 1993 SAMPLE RESULTS

FOR

CAMPBELL FOUNDRY - KEARNY YARD

1.0 5.0

BORING NUMBER	DEPTH (inches)	TCLP CADMIUM		TCLP LEAD	
		RESULT (mg/kg)	MDL (mg/kg)	RESULT (mg/kg)	MDL (mg/kg)
D-9	0-6	ND	0.02	0.31	0.1
	18-24	ND	0.02	0.14	0.1
D-6	0-6	ND	0.02	ND	0.1
	18-24	ND	0.02	ND	0.1
	0-6 AGW	ND	0.02	ND	0.1
H-7	0-6	ND	0.02	ND	0.1
	18-24	0.025	0.02	1.2	0.1
	0-6 AGW	0.39	0.02	55	0.1
J-5	0-6	ND	0.02	0.34	0.1
	18-24	0.046	0.02	2.7	0.1
	0-6 AGW	0.17	0.02	5.2	0.1
S-20	0-6	ND	0.02	ND	0.1
	18-24	ND	0.02	0.13	0.1
N-17	0-6	ND	0.02	ND	0.1
	18-24	ND	0.02	0.24	0.1
	0-6 AGW	ND	0.02	0.15	0.1

RESULTS REPORTED IN PARTS PER MILLION (ppm).
ND = NONE DETECTED
AGW = ABOVE GROUNDWATER

TABLE 3

SOIL SAMPLE ANALYTICAL RESULTS

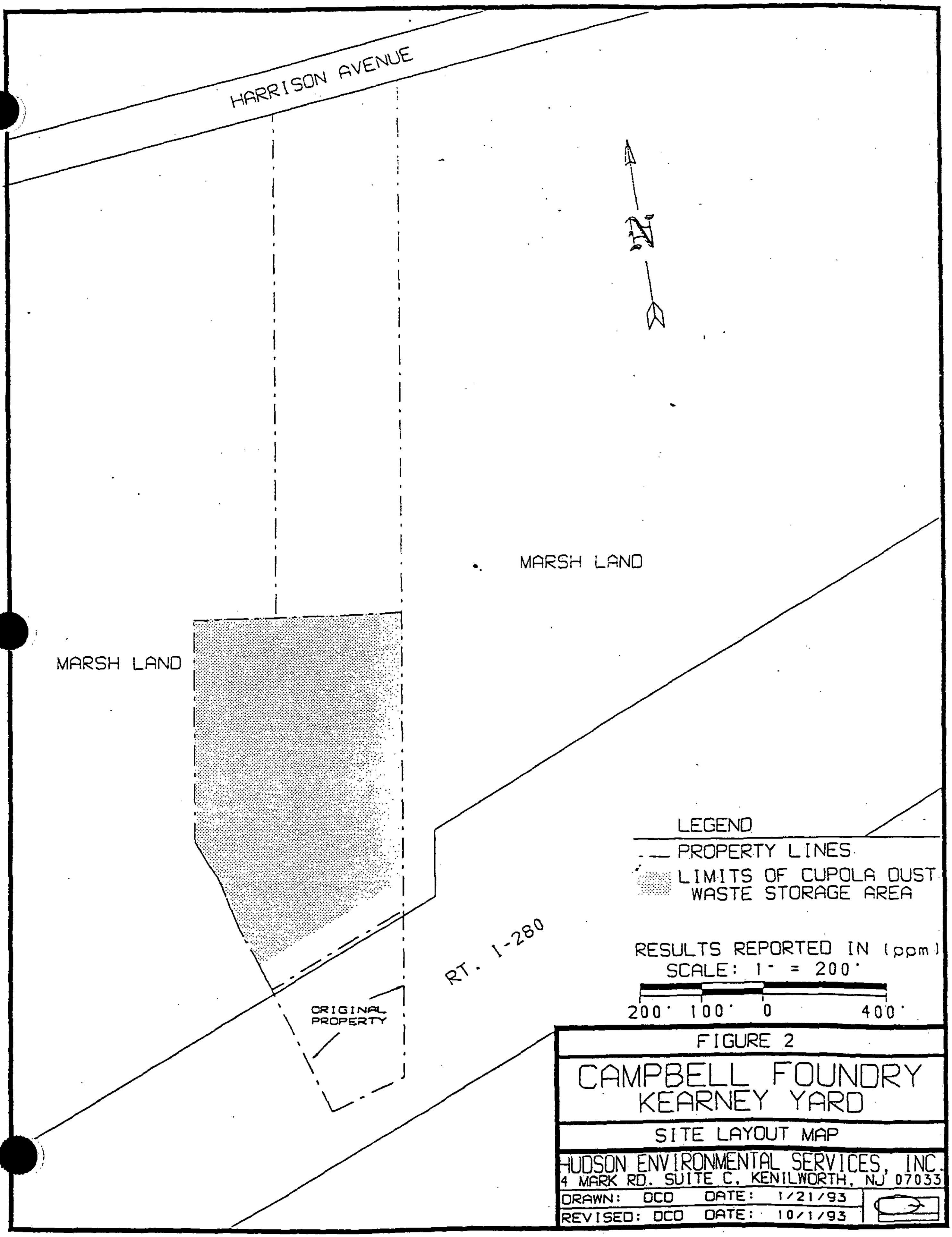
FOR

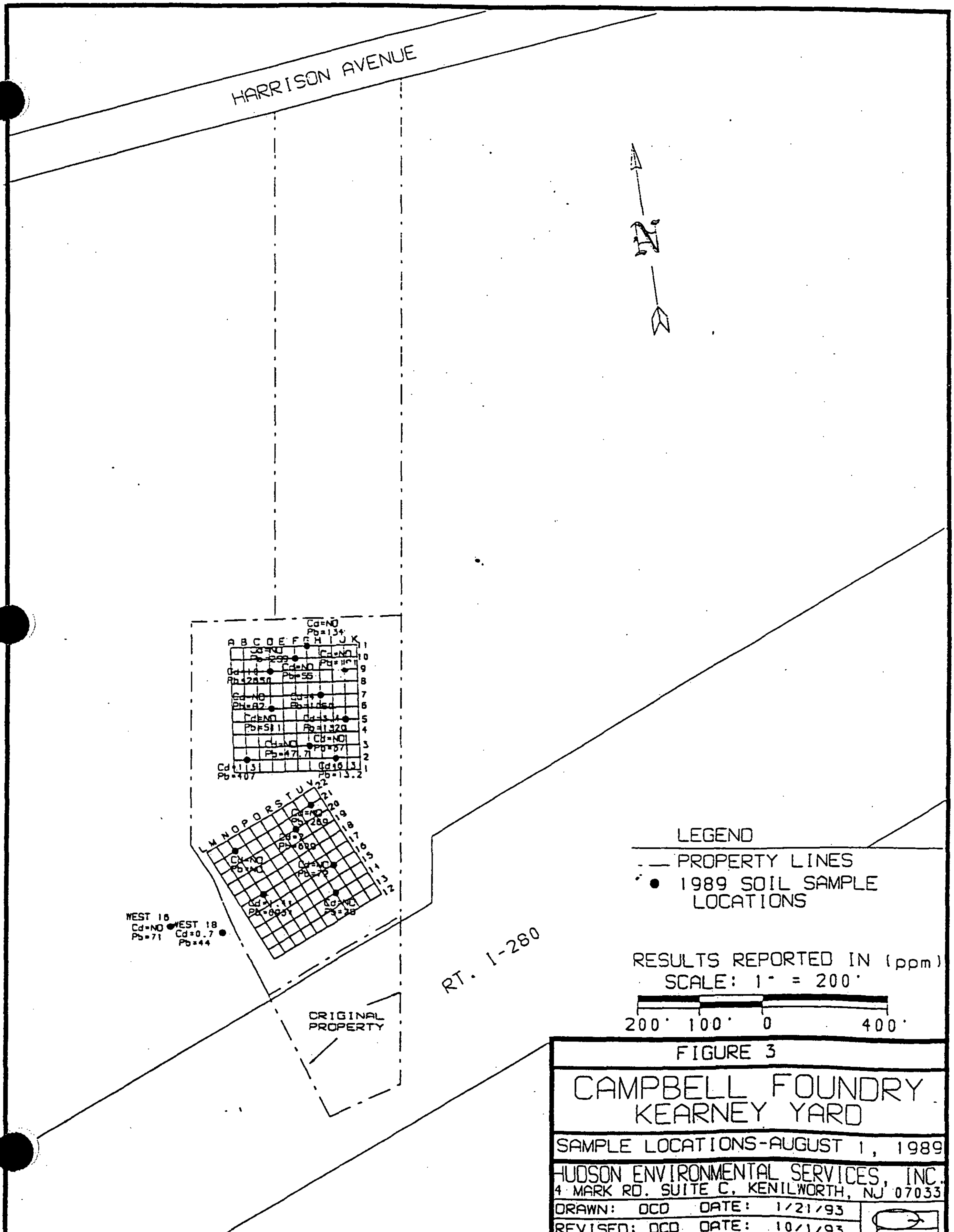
CAMPBELL FOUNDDRY - KEARNY YARD

5 ppm

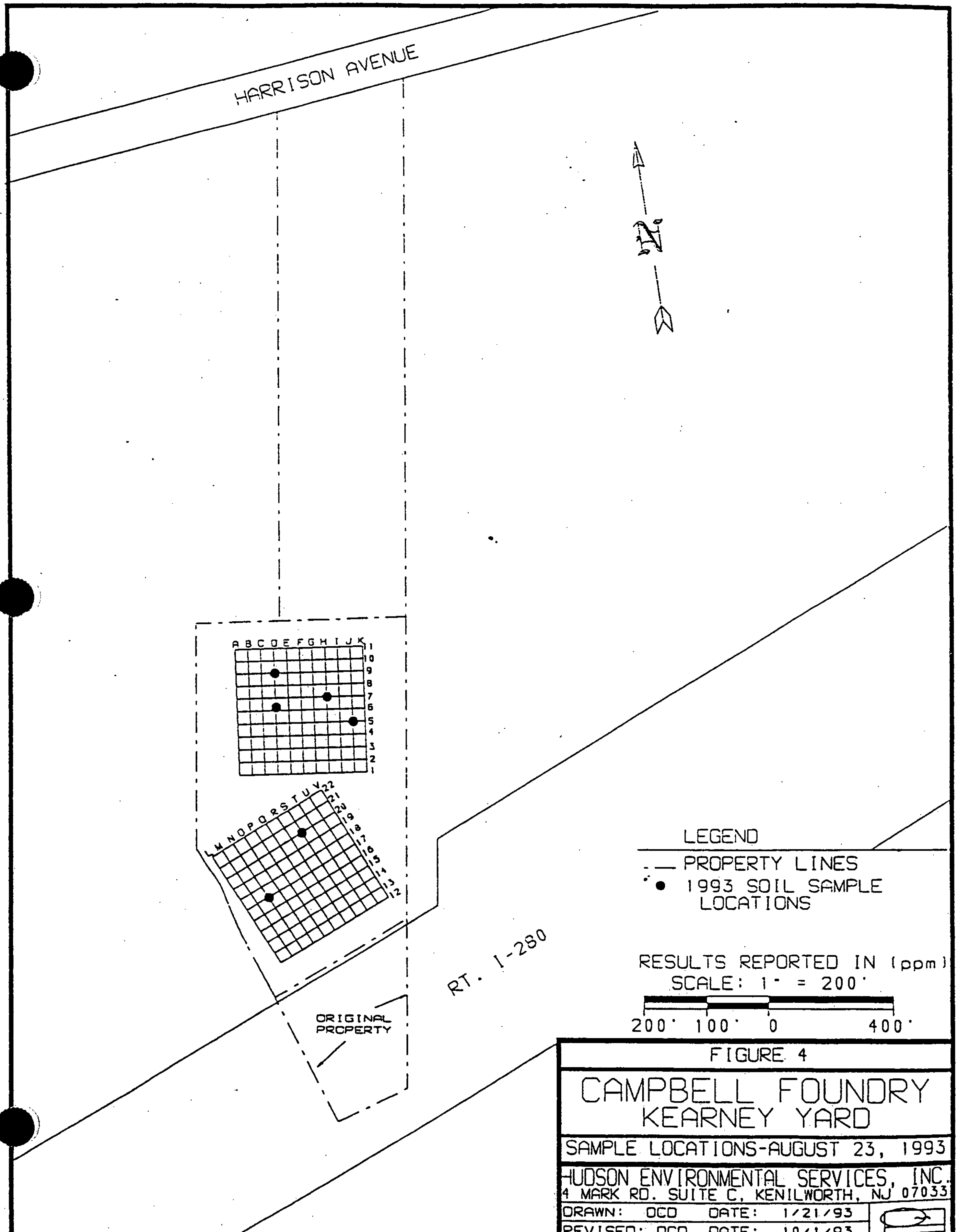
FIELD SAMPLE ID.	LAB SAMPLE ID.	SAMPLE DATE	SAMPLE DEPTH	TCLP METALS	
				LEAD	MDL
J5-1	AA19258	10/13/93	24-30"	27	0.5
J5-2	AA19259	10/13/93	24-30"	14	0.4
J5-3	AA19260	10/13/93	24-30"	65	1
J5-4	AA19261	10/13/93	24-30"	190	2.5
J5-5	AA19262	10/13/93	24-30"	8.6	0.1
J5-6	AA19263	10/13/93	24-30"	0.93	0.1
J5-7	AA19264	10/13/93	24-30"	0.76	0.1
J5-8	AA19265	10/13/93	24-30"	3.6	0.1
H7-1	AA19266	10/13/93	24-30"	52	1
H7-2	AA19267	10/13/93	24-30"	98	2
H7-3	AA19268	10/13/93	24-30"	33	1
H7-4	AA19269	10/13/93	24-30"	48	1
H7-5	AA19270	10/13/93	24-30"	4.4	0.1
H7-6	AA19271	10/13/93	24-30"	130	2.5
H7-7	AA19272	10/13/93	24-30"	48	1
H7-8	AA19273	10/13/93	24-30"	1.1	0.1
AVERAGE LEAD CONTAMINATION:				45.27	0.84

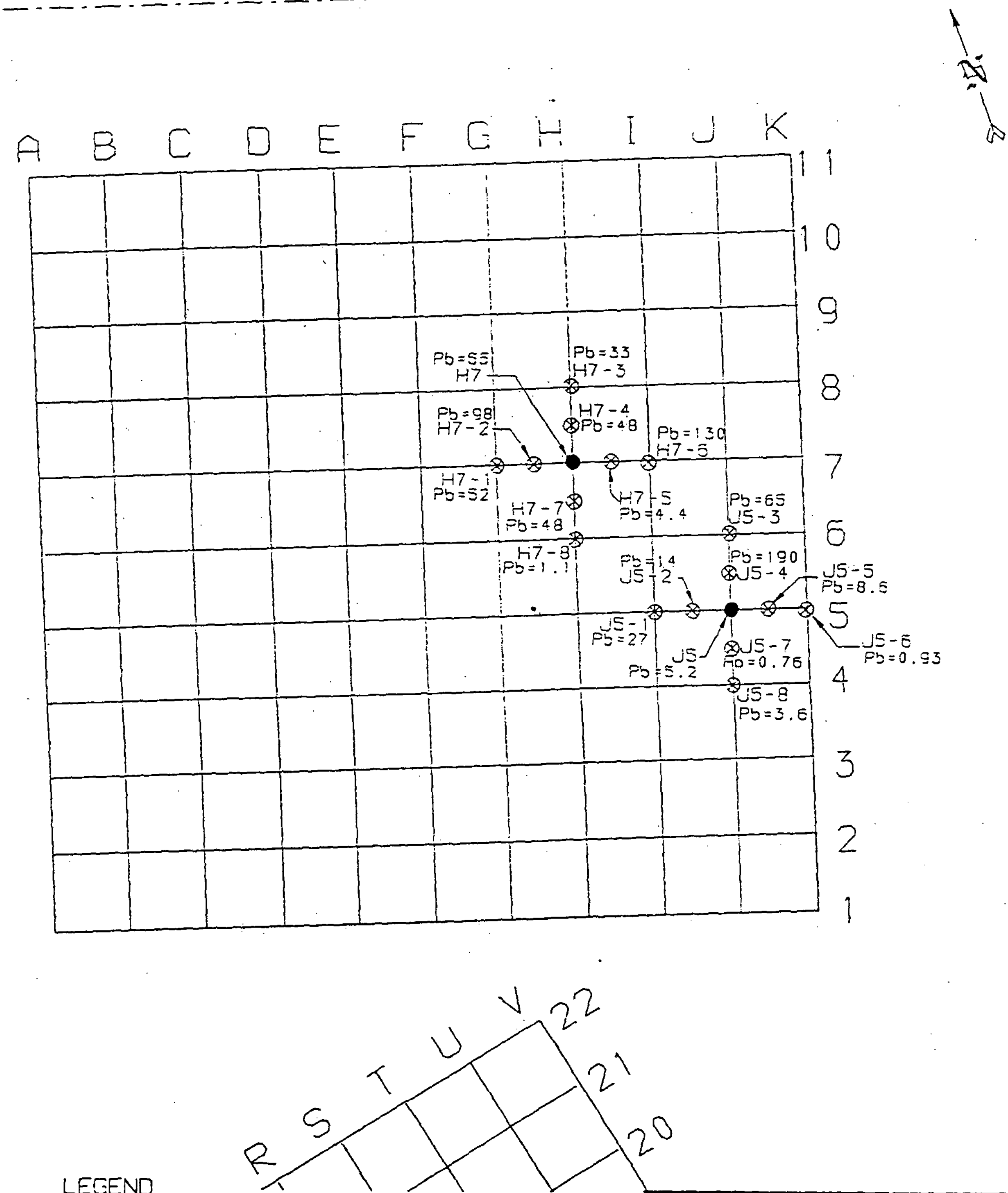
NOTE: ALL RESULTS REPORTED IN mg/L (PARTS PER MILLION).


HARRISON AVENUE
N
MARSH LAND
MARSH LAND
RT. I-280
ORIGINAL PROPERTY
LEGEND
PROPERTY LINES
LIMITS OF CUPOLA DUST WASTE STORAGE AREA
RESULTS REPORTED IN (ppm)
SCALE: 1" = 200'
200' 100' 0 400'
FIGURE 2
CAMPBELL FOUNDRY
KEARNEY YARD
SITE LAYOUT MAP
HUDSON ENVIRONMENTAL SERVICES, INC.
4 MARK RD. SUITE C, KENILWORTH, NJ 07033
DRAWN: DCD DATE: 1/21/93
REVISED: DCD DATE: 10/1/93



HARRISON AVENUE
N
RT. I-280
ORIGINAL PROPERTY
WEST 18 Cd=ND Pb=71
WEST 18 Cd=0.7 Pb=44
LEGEND
PROPERTY LINES
1989 SOIL SAMPLE LOCATIONS
RESULTS REPORTED IN (ppm)
SCALE: 1" = 200'
200' 100' 0 400'
FIGURE 3
CAMPBELL FOUNDRY KEARNEY YARD
SAMPLE LOCATIONS-AUGUST 1, 1989
HUDSON ENVIRONMENTAL SERVICES, INC.
4 MARK RD. SUITE C, KENILWORTH, NJ 07033
DRAWN: DCD DATE: 1/21/93
REVISED: DCD DATE: 10/1/93


HARRISON AVENUE
N
A B C D E F G H I J K
1 10 9 8 7 6 5 4 3 2 1
L M N O P Q R S T U V
22 21 20 19 18 17 16 15 14 13 12
RT. I-280
ORIGINAL PROPERTY
LEGEND
PROPERTY LINES
1993 SOIL SAMPLE LOCATIONS
RESULTS REPORTED IN (ppm)
SCALE: 1" = 200'
200' 100' 0 400'
FIGURE 4
CAMPBELL FOUNDRY
KEARNEY YARD
SAMPLE LOCATIONS-AUGUST 23, 1993
HUDSON ENVIRONMENTAL SERVICES, INC.
4 MARK RD. SUITE C, KENILWORTH, NJ 07033
DRAWN: DCD DATE: 1/21/93
REVISED: DCD DATE: 10/1/93



LEGEND

⊗ SOIL SAMPLE LOCATIONS - 10/13/93

● SOIL SAMPLE LOCATIONS - 8/23/93

Pb=TCLP LEAD CONTAMINATION

RESULTS REPORTED IN mg/l (ppm)

SAMPLE DEPTH = 24-30"

SCALE: 1" = 40'

40 20 0 40

FIGURE 5

CAMPBELL FOUNDRY
KEARNY YARD

DELINEATION SOIL SAMPLES

HUDSON ENVIRONMENTAL SERVICES, INC.
4 MARK ROAD, SUITE C, KENILWORTH, NJ 07033

DRAWN: DCD	DATE: 11/30/93
REVISED:	DATE:

10/27/88 HWMF 3

SUMMARY OF FINDINGS 1/4

FACILITY DESCRIPTION AND OPERATIONS

On 9/29/88 I conducted a RCRA inspection on Campbell Foundry Company (CFC) at 800 Bergen Street in Harrison, N.J. During the inspection I spoke with Mr. Robert Campbell, Company Vice President, and Mr. Clifford Gerweck, company environmental manager. The inspection consisted of a documentation review, an inspection of the hazardous waste storage area and a brief site tour.

CFC casts man-hole covers, catch basin covers and storm grates for use in roadways and parking lots. They buy scrap metal of all sorts, such as engine blocks and broken machinery and melts it in a coke fired furnace. The molten metal is then poured into sand molds for the finished product.

Hazardous waste generated by the process is a bag house dust which is EP toxic for lead, cadmium and chromium. The process generates about 7500 lbs/week. The dust is accumulated in multiple-ply paper sacks, which hold about 25 lbs each, and is stacked on pallets at the bag house vent. Each morning the bags ~~[illegible]~~ are dumped into a roll off

SUMMARY OF FINDINGS 2/4

FACILITY DESCRIPTION AND OPERATIONS

box which is used for final disposal. The waste is manifested to Waste Conversion Inc. in Hatfield, PA. in quantities of 30 cu. yds. at a time. Waste is removed between two and three times per month.

The facility also produces a metal slag waste that is handled as non-hazardous. about ten tons are generated each week.

The facility tour revealed nothing out of the ordinary. There is no hazardous waste on site except at the baghouse area, and the entire production area is covered with sand from the casting molds. The hazardous waste area was inspected and found to be in good order. The bags of dust were in good shape and the 30 cu. yd. roll off was about half full and properly labeled.

37 manifests were reviewed and found to be in compliance.

For the most part the facilities documentation was complete. However, the facility had not conducted the required semi-annual drills of the contingency plan procedures. The facility was cited for violation of 9.4(g)8.

SUMMARY OF FINDINGS 3/4

FACILITY DESCRIPTION AND OPERATIONS

also there was no documentation that the facility had made appropriate arrangements with local hospitals. They were cited for 9.6(f)4.

~~On 10/25/88 I did an inspection on the CEC site at 1035 Harrison Ave in Kearny. The [illegible] had picked its bag house dust.~~ There had been a contention that the facility had been operating an illegal land fill and thus was a TSD. However, the facility was able to document that it was a waste pile and not a land fill. (see letter dated May 16, 1988) The investigation is still ongoing to determine if the waste pile has been properly closed.

This site contains a maintenance garage and a stock yard. I was conducted to the site of the old waste pile by Mr. Robert Nelson, a worker for the yards. The stock yard area extends from Harrison Ave to nearly the edge of 280 W. The yard is covered in gravel (stone) and gradually gives way to were the waste pile was kept.

where

SUMMARY OF FINDINGS

4/4

FACILITY DESCRIPTION AND OPERATIONS

The waste pile area is approximately 200 ft long, ranges from approximately 60 to 80 ft wide and is approximately 6 ft above grade, judging from the ~~un~~ undeveloped area adjacent to it. (see fig. 1) The surface is a gritty black material and much trash, such as slag bits and brake shoes, are ~~~~ mixed in. No distinct features were apparent.

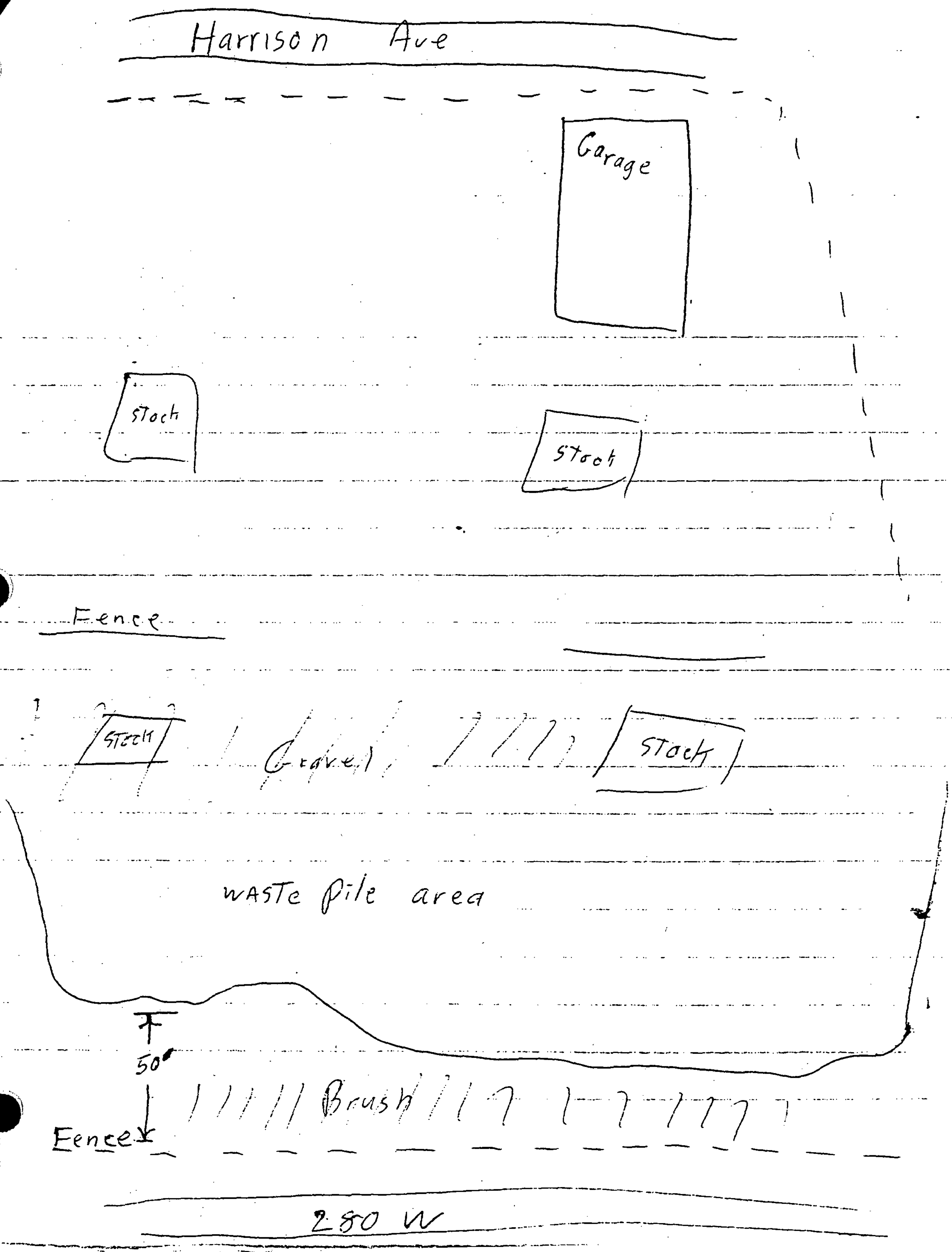
The facility is treated as a TSD, most likely because of the landfill/waste pile problem. But at the 800 Bergen street site they conduct generator only activities. As such, even though the TSD check list was used, only generator violations were enforced.

Additional Info

· NJD002445273 + NJT350014585 both are listed under the same address. However, the address at 1235 Harrison ave is for the landfill/wastepile while the production facility described above is located at 800 Bergen ST in Harrison, NJ

M A Sterling 10/27/88

Fig 1.



Harrison Ave
Garage
Stock
Stock
Fence
Stock
Gravel
Stock
waste pile area
50'
Brush
Fence
280 W

REMEDIAL INVESTIGATION REPORT
AND
REMEDIAL ACTION WORKPLAN

CAMPBELL FOUNDRY KEARNY YARD
1235 Harrison Avenue
Kearny, Hudson County, New Jersey

PREPARED FOR:

Campbell Foundry Company
800 Bergen Street
Harrison, New Jersey 07029

PREPARED BY:

Hudson Environmental Services, Inc.
4 Mark Road, Suite C
Kenilworth, New Jersey 07033

March 1996

4.2 Groundwater Sampling

Two (2) rounds of groundwater sampling have been conducted at the site. On July 22, 1994, one (1) monitoring well (MW-1) was installed. On August 12, 1994, groundwater at MW-1 was sampled for lead (filtered and unfiltered). The results of this first round of groundwater sampling have been presented to the NJDEP in Hudson's Remedial Investigation Report dated January 1995.

On October 25, 1995, six (6) additional monitoring wells, MW-2 through 7, were installed at the locations presented in Figure 2. The wells were installed by Lutz Environmental Company, Inc., Linden, New Jersey. A New Jersey licensed well driller, Mr. Richard Tabor (NJ License No. J1598), performed the installations. The work was performed subsequent to obtaining NJDEP Monitoring Well Permit number 2642436 (Attachment 2). Prior to the installation of the wells, all equipment and well construction materials were visually inspected by Hudson for obvious indications of contamination. The equipment and materials appeared to be clean and decontaminated.

The soil conditions encountered during the well installations were recorded on boring logs (Attachment 2). Soils primarily consisted of non-native fill underlain by black fine to coarse sand with little silt increasing in silt and clay content with depth. Bedrock was not encountered during the drilling activities.

The wells were constructed according to NJDEP guidelines for the installation of wells in unconsolidated formations. Monitoring Well Records and well construction diagrams are provided (Attachment 2). Following the well installations, the wells were developed with a submersible pump. Groundwater was pumped at a rate of less than five gallons per minute for one hour from each well.

The monitoring wells were constructed by advancing 8-inch diameter borings to six feet below grade. The wells were constructed of five-foot lengths of 4-inch diameter Schedule 40 polyvinyl chloride (PVC) 0.020-inch slot well screens and one-foot lengths of 4-inch diameter PVC Schedule 40 solid risers. A solid cap was attached to the bottom of the well screens. Gravel pack (#1 Morie Well Gravel) was then placed around the well screens. Annular seals of cement were placed above the gravel pack from near the ground surface to one foot below grade. Concrete pads were used to seat steel protective casings above the annular seals. The steel casings are equipped with manhole covers and locking well caps.

The locations of the groundwater monitoring wells were surveyed by a New Jersey Professional Land Surveyor, Mr. Henry E. Reynolds (NJ License No. 14820), on December 5, 1995 (Figure 5, Monitoring Well Locations). Groundwater level measurements were recorded by Hudson on November 9, 1995 and January 31, 1996. Based on these measurements, groundwater contour maps were developed (Groundwater Conditions Maps, Figures 6 and 7). Groundwater flow direction at the site was determined to be to the west-southwest.

On November 9, 1995, unfiltered groundwater samples from monitoring wells MW-1 through 7 were collected by Hudson for cadmium and lead analysis. Hudson's Groundwater Sampling Field Logs are presented in Attachment 3. A Groundwater Sample Analytical Results Summary for cadmium and lead is presented in Table 2. Reduced laboratory data deliverables are presented in Attachment 4. Groundwater from MW-1 and MW-3 exceeds NJDEP criteria for Class II-A groundwater for cadmium. Groundwater from all seven (7) monitoring wells exceeds the criteria for lead.

The greatest concentrations of cadmium and lead occur in MW-1 and MW-3. The concentrations in the other monitoring wells are approximately one order of magnitude less than in these two wells (Figure 8, Groundwater Contamination Map). Based on their relative locations with respect to the other wells (essentially upgradient and centrally located in the AOC), conclusions can be drawn regarding the spatial distribution and migrational history of the contaminants.

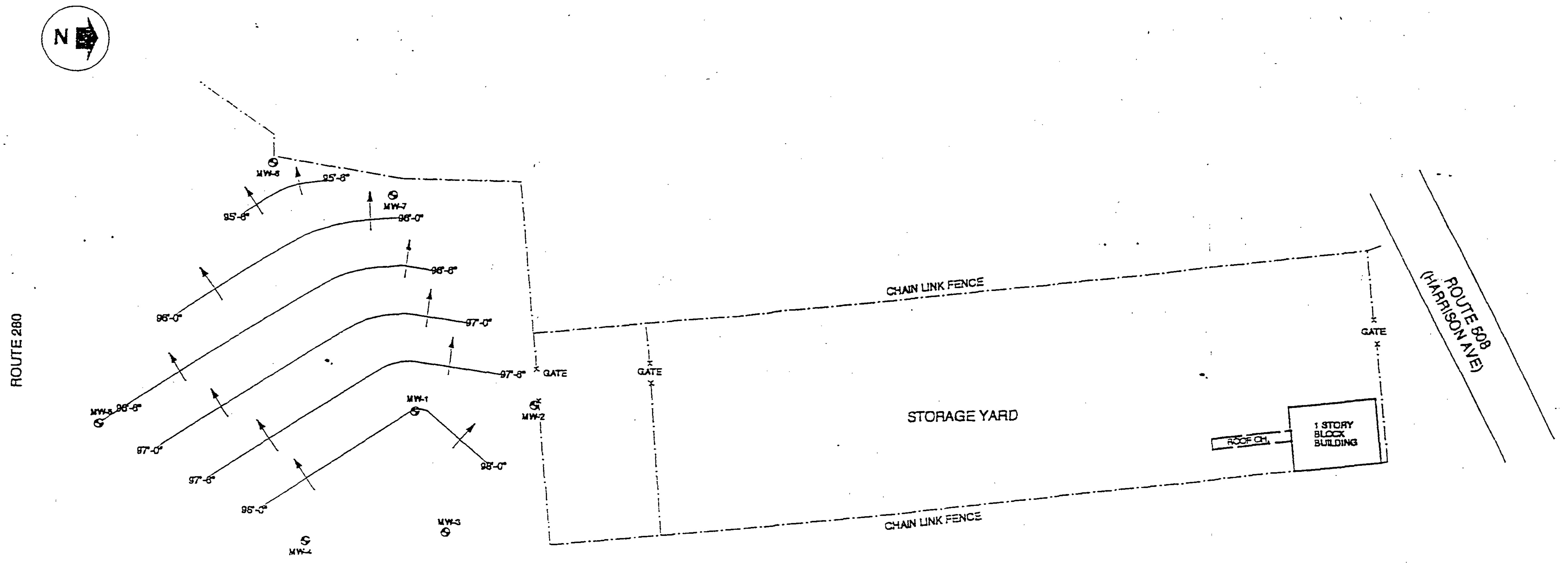
Since there are numerous contaminated sites affecting local groundwater, the elevated concentrations of metals in groundwater may be attributed, at least in part, to off-site sources located upgradient to the site. Specifically, soil at the Route 508 Expansion project has confirmed metals contamination which may have migrated to the site via groundwater transport. The Meadowlands Landfill is also expected to have impacted local groundwater. The mounding of leachate from the landfill could spread contaminants to all surrounding areas regardless of groundwater flow direction.

Since cadmium and lead are known to have been present in the former waste cupola emission dust piles at the site, and elevated concentrations of cadmium and lead have been detected in on-site soils, the groundwater contamination can be attributed to the former waste piles. However, the spatial distribution of contamination indicates that cadmium and lead have migrated relatively short distances in the 15 years since the waste piles were removed.

4.3 Recommendations

Hudson recommends the placement of an asphalt cap over the former waste cupola emission dust pile area to prevent future leaching of cadmium and lead from the soil to the groundwater during the downward movement of storm water and to prevent direct exposure to the lead and cadmium by potential receptors. The selection of an asphalt cap as the most appropriate remedial alternative is discussed in Section 5.0, Remedial Alternatives Analysis. The details of the remedial activities are presented in Section 6.0, Remedial Action Workplan, of this report.

Hudson also recommends continued groundwater monitoring for cadmium and lead to determine the effectiveness of the cap and to determine whether off-site, upgradient sources are contributing to the groundwater contamination. The groundwater monitoring program should consist of quarterly monitoring for approximately two (2) years with the performance of data evaluation following each sampling event.



NOVEMBER 11, 1995

WELL #	GROUNDWATER ELEVATION
1	98.02
2	97.83
3	98.19
4	98.50
5	96.52
6	95.22
7	95.76

SCALE 1" = 100'

100' 50' 0 100'

LEGEND

	MONITORING WELL LOCATION
	GROUNDWATER COUNTOUR LINES WITH FLOW DIRECTION ARROW

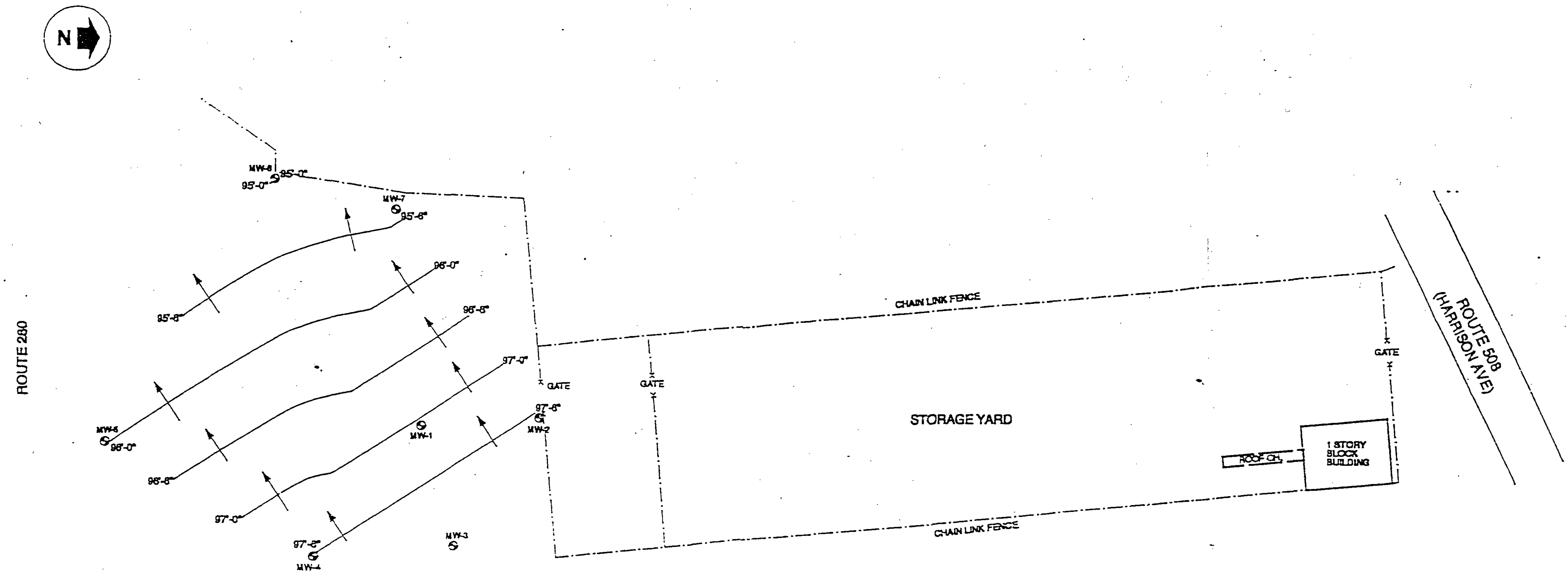
FIGURE 6

GROUNDWATER CONDITIONS MAP 11-9-95

CAMPBELL FOUNDRY-KEARNY YARD
1235 HARRISON AVENUE
KEARNY, NEW JERSEY

HUDSON ENVIRONMENTAL SERVICES INC.
4 MARK ROAD SUITE C, KENILWORTH NJ 07033

DRAWN BY: AGP DATE: 2-8-96
REVISED BY: DATE:



JANUARY 31, 1996	
WELL #	GROUNDWATER ELEVATION
1	-
2	97.56
3	97.41
4	97.51
5	95.97
6	94.98
7	95.39

SCALE 1" = 100'

100' 50' 0 100'

LEGEND	
⊖	MONITORING WELL LOCATION
⊥	GROUNDWATER CONTOUR LINES WITH FLOW DIRECTION ARROW

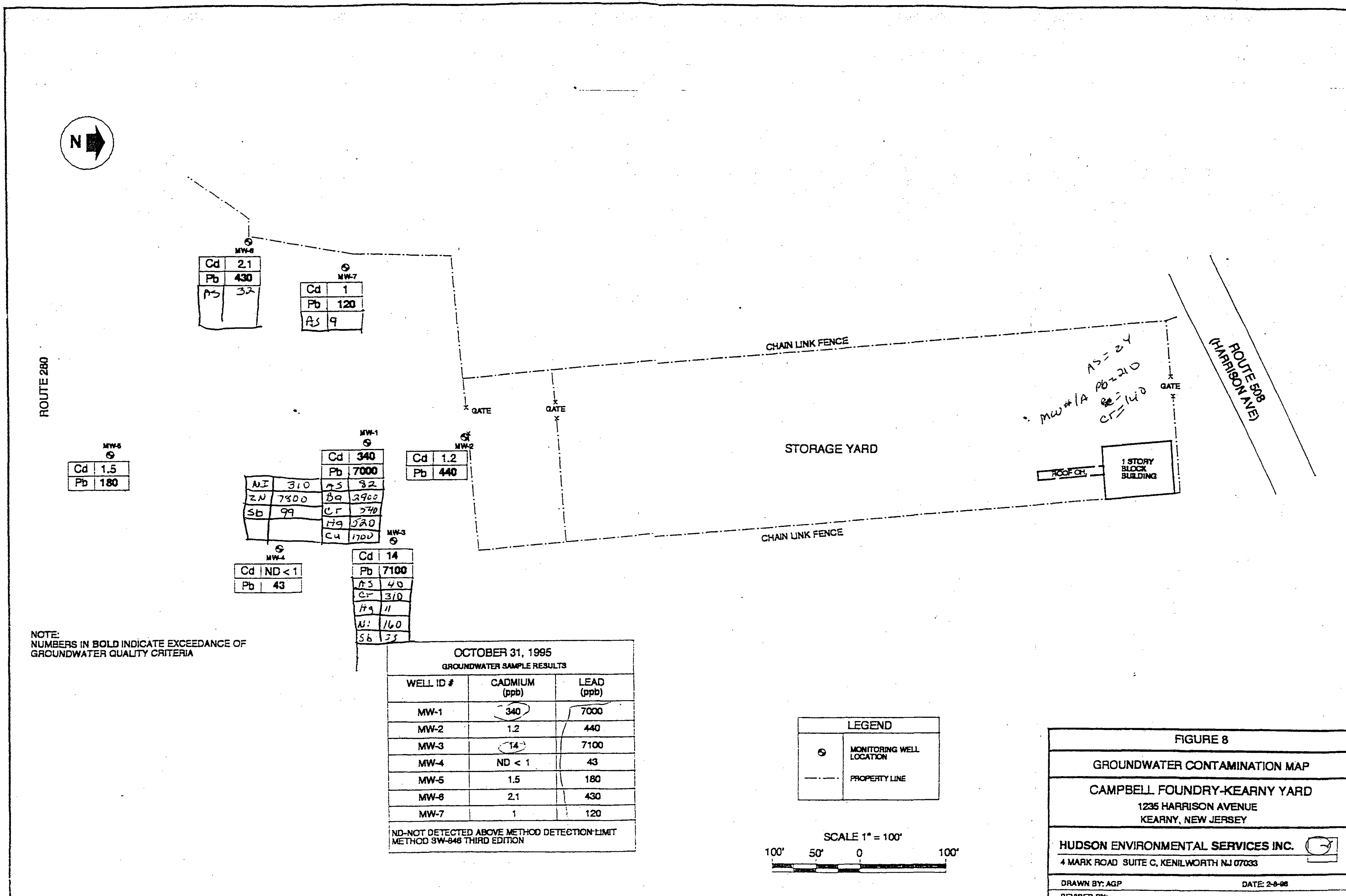
FIGURE 7

GROUNDWATER CONDITIONS MAP 1/31/96

CAMPBELL FOUNDRY-KEARNY YARD
1235 HARRISON AVENUE
KEARNY, NEW JERSEY

HUDSON ENVIRONMENTAL SERVICES INC.
4 MARK ROAD SUITE C, KENILWORTH NJ 07033

DRAWN BY: AGP	DATE: 2-6-96
REVISED BY:	DATE:



NOTE:
NUMBERS IN BOLD INDICATE EXCEEDANCE OF GROUNDWATER QUALITY CRITERIA

OCTOBER 31, 1995
GROUNDWATER SAMPLE RESULTS

WELL ID #	CADMIUM (ppb)	LEAD (ppb)
MW-1	340	7000
MW-2	1.2	440
MW-3	14	7100
MW-4	ND < 1	43
MW-5	1.5	180
MW-6	2.1	430
MW-7	1	120

ND-NOT DETECTED ABOVE METHOD DETECTION LIMIT
METHOD SW-846 THIRD EDITION

FIGURE 8

GROUNDWATER CONTAMINATION MAP

CAMPBELL FOUNDRY-KEARNY YARD
1235 HARRISON AVENUE
KEARNY, NEW JERSEY

HUDSON ENVIRONMENTAL SERVICES INC.
4 MARK ROAD SUITE C, KENILWORTH NJ 07033

DRAWN BY: AGP DATE: 2-8-96
REVISED BY: DATE:

C4. Newark-Jersey City Turnpike

SUBSURFACE INVESTIGATION for the
NEWARK/JERSEY CITY TURNPIKE
ROADWAY IMPROVEMENT PROJECT

Prepared for:

URBITRAN ASSOCIATES, INC.

and

THE COUNTY OF HUDSON

Prepared by:

EEA, *Inc.*

55 Hilton Avenue
Garden City, New York 11530
(516) 746-4400
(212) 227-3200

JANUARY 1995

Project: 94723

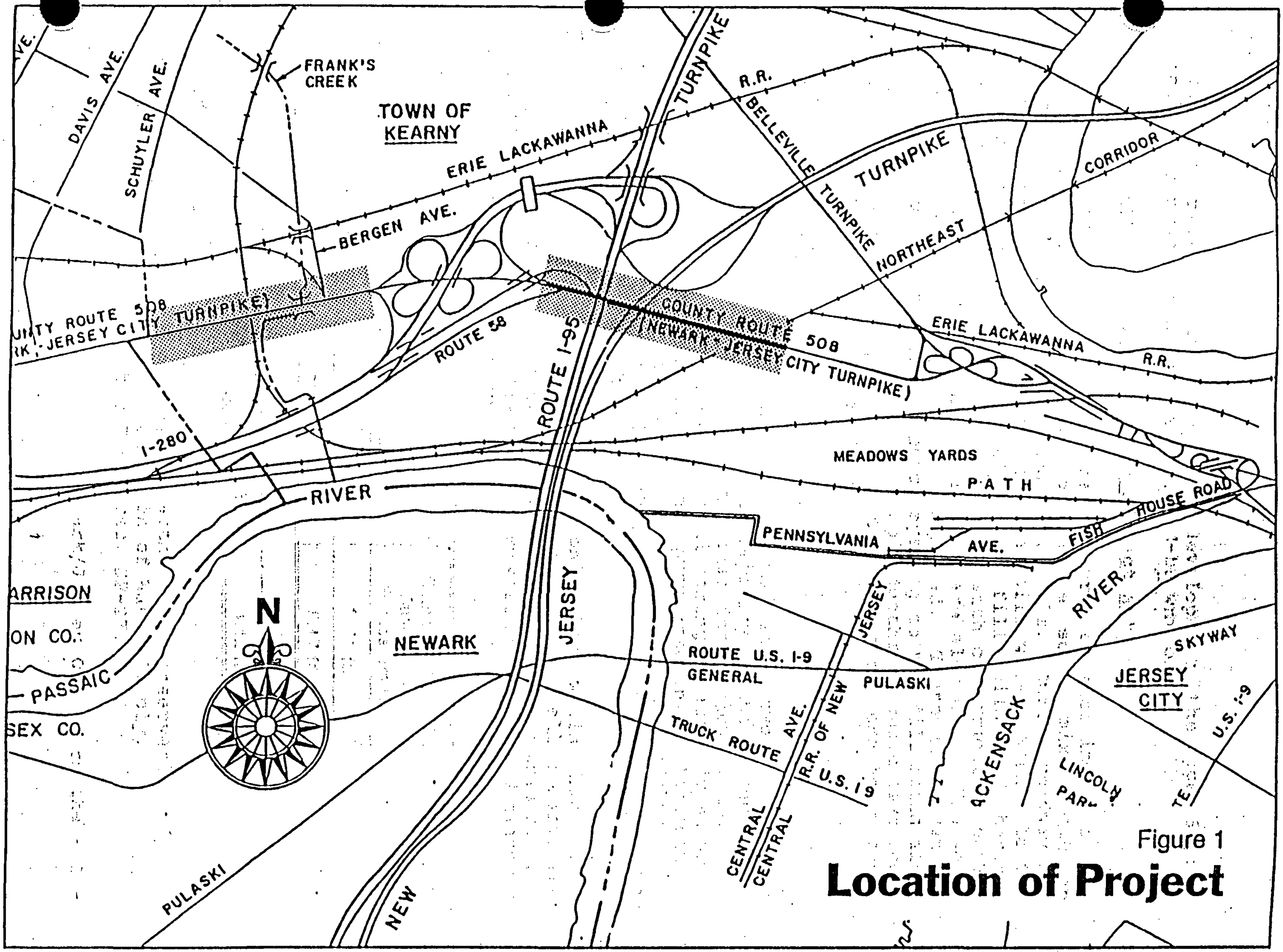


Figure 1
Location of Project

TEXT SAYS
TAL METALS

assume MDL .66 less average than 1 ppm

TABLE 2

TARGET COMPOUND LIST INORGANICS (mg/kg)
METALS

(Non Res) - 340 20 47000 +7 1000 - 270/20 (500)

Sample ID	Res Depth	– Aluminum	(14) Antimony	(20) Arsenic	(700) Barium	(4) 2 Beryllium	(1) Cadmium	– Calcium	(500) Chromium
S-1A	6-18"	7,600		2.9	69.7			12,300	15.4
S-2A	6-18"	9,540							14.4
S-3A	6-18"	4,090	15.2	2.9	191	2.1	5.8	34,600	79.3
S-4A	6-18"	5,050		7.6	74.8			6,240	23.0
S-5A	6-18"	8,180	15.0		93.6		1.7	9,240	30.2
S-6A	6-18"	3,250		21.5	995			2,990	11.0
S-7A	6-18"	9,700		2.1	67.9			9,130	16.4
S-8A	6-18"	4,500		6.5	72.8		1.5	6,510	41.4
S-9A	6-18"	5,330		5.1	197			8,250	59.3
S-10A	6-18"	2,380		5.5	92.1			13,300	22.7
S-11A	6-18"	3,770		10.3	151		3.1	5,170	109
S-12A	6-18"	1,090		10.4					4.1
S-13A	6-18"	2,630						3,220	9.2
S-13C	8-9'	3,580		2.3	87.3			2,140	20.2
S-14A	6-18"	2,460						2,510	10.5
S-14C	8-9'	2,570			35.9			1,350	18.8
S-15A	6-18"	2,250						1,500	10.1
S-15C	8-9'	4,410			339		1.7	3,900	32.8
S-16A	6-18"	4,010						2,680	10.1
S-16C	8-9'	7,000		3.1	93.1			1,670	19.1
S-17A	6-18"	4,270		7.0	112		2.5	8,510	188
S-17C	8-9'	2,900		2.4	66.1		1.7	14,100	60.3
S-18A	6-18"	1,640						1,150	12.1
S-19A	6-18"	2,530		20.1	230		2.4	4,530	37.0
S-19C	8-9'	1,430		8.5	56.2			2,110	10.0
S-20A	6-18"	1,740							10.3
S-20C	8-9'	6,180		2.8	99.7			3,680	14.9
S-21A	6-18"	11,300		6.0	109	0.95	0.70	1,760	39.5
S-21C	8-9'	5,410		7.0	193	0.68	3.2	7,170	81.7

okay okay okay okay

TABLE 2 - Continued

TARGET COMPOUND LIST INORGANICS (mg/kg)
METALS

Non Res — 340 20 47000 1 100 (500)

Sample ID	(Res) Depth	— Aluminum	(14) Antimony	(20) Arsenic	(200) Barium	(1) Beryllium	(1) Cadmium	— Calcium	Chromium
S-22A	6-18"	9,690		8.9	103	0.90		2,650	18.5
S-22C	8-9'	14,500		1.5	50.7	0.73		6,440	36.6
S-23A	6-18"	1,460		2.7	71.8			1,610	5.4
S-23C	8-9'	12,300		1.6	110	0.76	0.67	1,180	17.9
S-24A	6-18"	1,420		23.9	124			2,160	12.6
S-24C	8-9'	9,190		3.0	57.2			14,700	16.5
S-25A	6-18"	1,260		12.4	43.8		0.67	1,300	11.1
S-25C	8-9'	9,130		10.2	46.3			7,660	10.0
S-26A	6-18"	5,170		12.7	64.4		1.1	5,330	15.4
S-26C	8-9'	20,700		10.1	97.4	0.76	1.3	11,100	40.5
S-27A	6-18"	6,500		5.0	65.9		0.96	5,310	37.3
S-27C	8-9'	7,770		4.2	41.9			1,350	9.8
S-28	6-24"	3,230		3.8	29.3			13,100	11.4
S-29	6-24"	9,960			85.7	0.78	0.64	6,620	32.7
S-30	6-24"	11,500		4.9	130	0.60	0.66	2,700	35.1
S-31	6-24"	4,450		8.0	129		1.7	3,410	332
S-32	6-24"	79,800	10.4	13.7	129	0.89		79,800	2,200
S-33	6-24"	12,900		8.0	149	0.52	4.0	10,200	101
S-34	6-24"	4,910		8.5	81.4		1.2	4,690	147
S-35	6-24"	7,050		6.3	81.8		0.88	5,520	70.9
S-36A	6-25"	2,630		11.8	110		1.5	1,890	66.9
S-36B	5-7'	6,960		15.7	267		1.0	18,200	290
S-37A	6-24"	2,680		11.2	55.7		1.3	2,850	33.0
S-37B	5-6'	9,040		1.7	68.9		0.81	2,250	23.1

otly otly

4129
.924
5.053
5.3

delinea

[illegible]

TABLE 2 - Continued

TARGET COMPOUND LIST INORGANICS (mg/kg)
METALS

NonRes — 600 — 600 — 270 2400 3100

Sample ID	Res Depth	— Cobalt	(600) Copper	— Iron	(400) Lead	— Magnesium	(14) Mercury	(250) Nickel	(63) Selenium
S-1A	6-18"		114	13,200	35.1	3,960		21.2	
S-2A	6-18"		20.1	15,700		2,250		9.5	
S-3A	6-18"	19.6	2,820	130,000	132	17,200	0.51	143	
S-4A	6-18"		755	14,300	218	3,000	0.45	27.8	
S-5A	6-18"		57.0	16,300		6,490		19.5	
S-6A	6-18"		94.8	14,800	46.6	81.4	0.39	11.7	
S-7A	6-18"		138	16,100	28.8	7,790	0.99	16.5	
S-8A	6-18"		116	11,000	99.4	3,960	0.41	24.6	
S-9A	6-18"		231	19,100	546	2,810	0.52	33.8	
S-10A	6-18"		42.6	17,600	297	6,380		26.8	
S-11A	6-18"		330	19,400	477	2,390	0.67	50.4	1.2
S-12A	6-18"		8.4	10,100					1.4
S-13A	6-18"		23.9	6,480	24.9	1,360		21.0	
S-13C	8-9'		49.7	10,900	124	1,720	0.26	13.2	
S-14A	6-18"		14.9	6,480	14.4	1,910		15.2	
S-14C	8-9'		35.7	8,730	92.5	1,560	0.27	15.9	
S-15A	6-18"		17.0	5,080	46.4	1,060	0.13	16.6	
S-15C	8-9'		134	12,100	571	2,010		45.6	
S-16A	6-18"		25.5	9,120	17.0	2,420	0.18	14.9	
S-16C	8-9'		63.5	14,100	63.0	2,500	0.64	34.5	
S-17A	6-18"		138	20,900	321	2,450	0.73	115	
S-17C	8-9'		244	29,900	221	4,080	0.16	38.4	
S-18A	6-18"		11.8	5,510	42.6		0.12	9.5	
S-19A	6-18"		211	17,400	619	1,020	0.70	79.8	1.7
S-19C	8-9'		25.3	5,740	394	100	0.28	11.1	1.6
S-20A	6-18"		6.5	4,700	11.0	1,090	0.45		
S-20C	8-9'		48.7	12,000	55.5	2,990	0.14	16.2	
S-21A	6-18"	10.6	59.9	24,400	104	4,920	0.31	95.9	0.62
S-21C	8-9'	9.3	196	23,600	641	3,370	0.15	105	0.78

dry dry dry dry

TABLE 2 - Continued

TARGET COMPOUND LIST INORGANICS (mg/kg)
METALS

Non Res — 600 — 600 — 270 2400 3100

Sample ID	Res Depth	— Cobalt	(600) Copper	— Iron	(400) Lead	— Magnesium	(14) Mercury	(250) Nickel	(63) Selenium
S-22A	6-18"	9.3	76.1	20,000	42.6	3,840		23.1	0.56
S-22C	8-9′	9.4	442	20,200	12.9	7,360		20.4	
S-23A	6-18"		18.6	4,810	5.4	[illegible]	0.36	5.7	0.61
S-23C	8-9′	10.7	24.9	18,200		5,900	0.14	21.8	
S-24A	6-18"		44.4	31,100	33.5	[illegible]	0.50	11.1	1.4
S-24C	8-9′	7.4	39.2	15,600	17.2	4,110		16.2	
S-25A	6-18"		29.2	21,500		[illegible]		12.9	1.4
S-25C	8-9′		159	19,800	16.8	3,120	1.2	21.4	0.98
S-26A	6-18"	6.6	159	13,700	180	2,600	0.44	19.5	1.0
S-26C	8-9′	23.5	243	36,800	69.5	9,080	2.6	42.8	
S-27A	6-18"		68.8	18,300		2,770	1.0	17.9	
S-27C	8-9′		18.0	4,850		1,020		7.7	
S-28	6-24"		19.9	9,300	21.7	4,730		8.5	
S-29	6-24"	13.0	17.9	16,400	32.1	7,450		32.8	
S-30	6-24"	10.9	65.2	17,700	99.2	2,270	0.68	41.3	0.65
S-31	6-24"	9.4	171	17,400	427	1,640	0.41	41.6	0.69
S-32	6-24"	26.5	41.9	26,000	160	4,380	0.42	145	1.2
S-33	6-24"	10.5	250	34,700	388	4,750	0.82	84.8	0.82
S-34	6-24"	5.8	85.8	16,400	263	1,690	0.32	22.8	0.79
S-35	6-24"	6.1	70.8	25,100	71.0	1,490	0.28	14.3	0.50
S-36A	6-25"	6.1	136	18,400	223	700	0.37	20.1	1.2
S-36B	5-7′	9.5	69.9	37,600	18.4	3,140	0.17	106	1.5
S-37A	6-24"		83.8	13,800	145	1,580	0.50	18.4	1.9
S-37B	5-6′	7.7	39.9	21,000	19.0	3,950	0.16	20.3	

TABLE 2 - Continued

TARGET COMPOUND LIST INORGANICS (mg/kg)
METALS

4100 — 2 7100 1500 21,000

Sample ID	Depth	(110) Silver	– Sodium	(2) Thallium	(370) Vanadium	(4500) Zinc	(1100) Cyanide	Tin	
S-1A	6-18"				23.9	149			
S-2A	6-18"				21.5	31.1			
S-3A	6-18"		1,230		59.9	2,720			
S-4A	6-18"				29.2	438	0.6		
S-5A	6-18"				36.1	66.1			
S-6A	6-18"				20.6	86.3			
S-7A	6-18"				32.7	165			
S-8A	6-18"				31.6	269			
S-9A	6-18"		1,250		43.0	554			
S-10A	6-18"				26.6	164			
S-11A	6-18"				36.6	672			
S-12A	6-18"					8.0			
S-13A	6-18"				11.5	99.8			
S-13C	8-9'				16.0	142		23.4	
S-14A	6-18"				12.7	38.1			
S-14C	8-9'				13.7	117			
S-15A	6-18"					57.0			
S-15C	8-9'				25.1	356			
S-16A	6-18"				24.6	38.7			
S-16C	8-9'				19.7	112			
S-17A	6-18"				34.4	365			
S-17C	8-9'				27.3	261		42.0	
S-18A	6-18"					32.5			
S-19A	6-18"				24.9	444		57.4	
S-19C	8-9'				12.4	93.3			
S-20A	6-18"					21.2			
S-20C	8-9'				20.9	113			
S-21A	6-18"				35.0	210			
S-21C	8-9'				44.5	583			

TABLE 2 - Continued

TARGET COMPOUND LIST INORGANICS (mg/kg)
METALS

4100 – 2 7100 1500 21,000

Sample ID	Depth	110 Silver	– Sodium	(2) Thallium	(370) Vanadium	(1500) Zinc	(1100) Cyanide	Tin	
S-22A	6-18"		806		28.7	147			
S-22C	8-9′		1,340		62.7	52.2	0.7		
S-23A	6-18"				12.2	10.2			
S-23C	8-9′				26.6	56.9			
S-24A	6-18"				17.5	99.9			
S-24C	8-9′		624		29.9	73.0			
S-25A	6-18"				22.1	17.2			
S-25C	8-9′		1,820		39.1	167			
S-26A	6-18"	2.6			20.4	191			
S-26C	8-9′		3,150		84.1	507			
S-27A	6-18"		1,260		25.5	87.6			
S-27C	8-9′				11.2	14.6			
S-28	6-24"				15.8	59.0			
S-29	6-24"		2,290		34.2	155	0.7		
S-30	6-24"		1,400		38.9	112			
S-31	6-24"				45.6	388			
S-32	6-24"		1,120		104	107			
S-33	6-24"				46.5	628			
S-34	6-24"		693		37.9	200			
S-35	6-24"				46.2	175			
S-36A	6-25"		611		30.2	262			
S-36B	5-7′		733		32.1	312			
S-37A	6-24"				22.2	173			
S-37B	5-6′		919		27.1	128			

maybe okay on area; for PCB's depends on MDL's

TABLE 5

SUMMARY OF PESTICIDES AND PCBs COMPOUNDS DETECTED

Identification Number	Depth (inches)	Location	Parameter	Compounds Detected (ppb)
S-1A S-1B	6-18 18-24	51+77, So. 51+77, So.	Full -VOA* VOA only	N.D.
S-2A S-2B	6-18 18-24	54+10, No. 54+10, No.	Full -VOA VOA only	N.D.
S-3A S-3B	6-18 18-24	59+00, No. 59+00, No.	Full -VOA VOA only	Aroclor (1260) - 730
S-4A	6-18	57+50, So.	Full -VOA	Dieldrin - 63 42/180 4,4, DDD - 53 4,4, DDE - 45 4'-4' DDT - 260 Aroclor (1260) - 250
S-4B	18-24	57+50, So.	VOA only	N.D.
S-5A S-5B	6-18 18-24	61+50, No. 61+50, No.	Full -VOA VOA only	N.D.
S-6A S-6B	6-18 18-24	65+50, No. 65+50, No.	Full -VOA VOA only	Aldrin - 67 40/170
S-7A S-7B	6-18 18-24	66+40, So. 66+40, So.	Full -VOA VOA only	N.D.
S-8A	6-18	72+00, So.	Full -VOA	Lindane - 29 Heptachlor - 30 150/650 Aldrin - 33 Dieldrin - 50 4,4,DDT - 86 Endrin - 56
S-8B	18-24	72+00, So.	VOA only	
S-9A S-9B	6-18 18-24	73+50, So. 73+50, So.	Full -VOA VOA only	Aroclor (1260) - 470 N.D.
S-10A S-10B	6-18 18-24	76+50, So. 76+50, So.	Full -VOA VOA only	N.D.
S-11A S-11B	6-18 18-24	75+50, No. 75+50, No.	Full -VOA VOA only	N.D.
S-12A S-12B	6-18 18-24	82+50, So. 82+50, So.	Full -VOA VOA only	Aldrin - 13
S-13A S-13B S-13C	6-18 18-24 8-9 feet	113+75, So. 113+75, So. 113+75, So.	Full -VOA VOA only Full list	N.D. Aroclor (1260) - 180
S-14A S-14B S-14C	6-18 18-24 8-9 feet	115+00, So. 115+00, So. 115+00, So.	Full -VOA VOA only Full List	N.D. Aroclor (1260) - 140

TABLE 5 - Continued

SUMMARY OF PESTICIDES AND PCBs COMPOUNDS DETECTED

Identification Number	Depth (inches)	Location	Parameter	Compounds Detected (ppb)
S-15A	6-18	116+00, So.	Full -VOA	N.D.
S-15B	18-24	116+00, So.	VOA only	
S-15C	8-9 feet	116+00, So.	Full List	N.D.
S-16A	6-18	117+50, So.	Full -VOA	N.D.
S-16B	18-25	117+50, So.	VOA only	
S-16C	8-9 feet	117+50, So.	Full List	N.D.
S-17A	6-18	120+00, So.	Full -VOA	Endrin Aldehyde - 150 Aroclor (1260) - 620
S-17B	18-24	120+00, So.	VOA only	
S-17C	8-9 feet	120+00, So.	Full List	4,4'DDE - 47 4,4-DDD - 45 alpha Chlordane - 38 gamma Chlordane - 34 Aroclor (1260) - 1,600
S-18A	6-18	125+00, So.	Full -VOA	N.D.
S-18B	18-24	125+00, So.	VOA only	
S-19A	6-18	130+00, So.	Full -VOA	N.D.
S-19B	18-24	130+00, So.	VOA only	
S-19C	8-9 feet	130+00, So.	Full List	N.D.
S-20A	6-18	132+00, So.	Full -VOA	Aroclor (1260) - 320
S-20B	18-24	132+00, So.	VOA only	
S-20C	8-9 feet	132+00, So.	Full List	N.D.
S-21A	6-18	134+00, So.	Full -VOA	N.D.
S-21B	18-24	134+00, So.	VOA only	
S-21C	8-9 feet	134+00, So.	Full List	Aroclor (1260) - 210 (in duplicate)
S-22A	6-18	136+00, So.	Full -VOA	N.D.
S-22B	18-24	136+00, So.	VOA only	
S-22C	8-9 feet	136+00, So.	Full List	N.D.
S-23A	6-18	138+00, So.	Full -VOA	N.D.
S-23B	18-24	138+00, So.	VOA only	
S-23C	8-9 feet	138+00, So.	Full List	N.D.
S-24A	6-18	140+00, So.	Full -VOA	N.D.
S-24B	18-24	140+00, So.	VOA only	
S-24C	8-9 feet	140+00, So.	Full List	N.D.
S-25A	6-18	142+00, So.	Full -VOA	N.D.
S-25B	18-24	142+00, So.	VOA only	
S-25C	8-9 feet	142+00, So.	Full List	N.D.
S-26A	6-18	144+00, So.	Full -VOA	N.D.
S-26B	18-24	144+00, So.	VOA only	
S-26C	8-9 feet	144+00, So.	Full List	N.D.

TABLE 5 - Continued

SUMMARY OF PESTICIDES AND PCBs COMPOUNDS DETECTED

Identification Number	Depth (inches)	Location	Parameter	Compounds Detected (ppb)
S-27A S-27B S-27C	6-18 18-24 8-9 feet	147+00, So. 147+00, So. 147+00, So.	Full -VOA VOA only Full List	N.D. N.D.
S-28	6-24	150+00, So.	Full List	N.D.
S-29	6-24	153+00, So.	Full List	N.D.
S-30	6-24	157+00, So.	Full List	Aroclor (1260) - 530
S-31	6-24	160+00, So.	Full List	N.D.
S-32	6-24	165+00, So.	Full List	N.D.
S-33	6-24	168+00, So.	Full List	Aroclor (1260) - 290
S-34	6-24	170+00, So.	Full List	N.D.
S-35	6-24	171+00, So.	Full List	N.D.
S-36A S-36B	6-24 5-6 feet	166+50, So. 166+50, So.	Full List Full List	Aroclor (1260) - 140 N.D.
S-37A S-37B	6-24* 5-6 feet	166+60, So. 166+60, So.	Full List Full List	Aroclor (1260) - 480 N.D.

* Full -VOA = Full list minus VOAs

ppb = parts per billion
N.D. = not detected

PAH are a problem for PCS

TABLE 6

SUMMARY OF SEMI-VOLATILE COMPOUNDS DETECTED

Identification Number	Depth (inches)	Location	Parameter	Compounds Detected (ppb)
S-1A S-1B	6-18 18-24	51+77, So. 51+77, So.	Full -VOA* VOA only	N.D.
S-2A S-2B	6-18 18-24	54+10, No. 54+10, No.	Full -VOA VOA only	N.D.
S-3A S-3B	6-18 18-24	59+00, No. 59+00, No.	Full -VOA VOA only	N.D.
S-4A S-4B	6-18 18-24	57+50, So. 57+50, So.	Full -VOA VOA only	N.D.
S-5A S-5B	6-18 18-24	61+50, No. 61+50, No.	Full -VOA VOA only	N.D.
S-6A S-6B	6-18 18-24	65+50, No. 65+50, No.	Full -VOA VOA only	N.D.
S-7A S-7B	6-18 18-24	66+40, So. 66+40, So.	Full -VOA VOA only	Fluoranthene - 490 Pyrene - 470
S-8A S-8B	6-18 18-24	72+00, So. 72+00, So.	Full -VOA VOA only	N.D.
S-9A S-9B	6-18 18-24	73+50, So. 73+50, So.	Full -VOA VOA only	Fluoranthene - 2,800 Pyrene - 3,400 Benzo(b)fluoranthene - 1,900 Benzo(k) fluoranthene - 2,500
S-10A S-10B	6-18 18-24	76+50, So. 76+50, So.	Full -VOA VOA only	N.D.
S-11A S-11B	6-18 18-24	75+50, No. 75+50, No.	Full -VOA VOA only	N.D.
S-12A S-12B	6-18 18-24	82+50, So. 82+50, So.	Full -VOA VOA only	N.D.
S-13A S-13B S-13C	6-18 18-24 8-9 feet	113+75, So. 113+75, So. 113+75, So.	Full -VOA VOA only Full list	N.D. N.D.
S-14A S-14B S-14C	6-18 18-24 8-9 feet	115+00, So. 115+00, So. 115+00, So.	Full -VOA VOA only Full List	N.D. N.D.
S-15A S-15B S-15C	6-18 18-24 8-9 feet	116+00, So. 116+00, So. 116+00, So.	Full -VOA VOA only Full List	N.D. N.D.

TABLE 6 - Continued

SUMMARY OF SEMI-VOLATILE COMPOUNDS DETECTED

Identification Number	Depth (inches)	Location	Parameter	Compounds Detected (ppb)
S-16A	6-18	117+50, So.	Full -VOA	N.D.
S-16B	18-25	117+50, So.	VOA only	
S-16C	8-9 feet	117+50, So.	Full List	bis(2-Ethylhexyl) phthalate - 12,000
S-17A	6-18	120+00, So.	Full -VOA	Phenanthrene - 8,200 Anthracene - 2,200 Fluoranthene - 11,000 Pyrene - 13,000 Benzo(a)anthracene - 5,800 Chrysene - 5,500 Benzo(b)fluoranthene - 9,000 Benzo(k)fluoranthene - 8,200 Benzo(a)pyrene - 6,500 Indeno(1,2,3-cd)pyrene - 3,000
S-17B	18-24	120+00, So.	VOA only	N.D.
S-17C	8-9 feet	120+00, So.	Full List	
S-18A	6-18	125+00, So.	Full -VOA	N.D.
S-18B	18-24	125+00, So.	VOA only	
S-19A	6-18	130+00, So.	Full -VOA	Phenanthrene - 1,400 Fluoranthene - 2,000 Pyrene - 2,400 Benzo(a)anthracene - 1,200 Chrysene - 1,400
S-19B	18-24	130+00, So.	VOA only	
S-19C	8-9 feet	130+00, So.	Full List	Phenanthrene - 990 Fluoranthene - 1,200 Pyrene - 1,800 Benzo(a)anthracene - 820 Chrysene - 1,100 Benzo(b)fluoranthene - 440 Benzo(k)fluoranthene - 510 Benzo(a)pyrene - 490
S-20A	6-18	132+00, So.	Full -VOA	Pyrene - 4,200
S-20B	18-24	132+00, So.	VOA only	
S-20C	8-9 feet	132+00, So.	Full List	Phenol - 690 Phenanthrene - 700 Fluoranthene - 860 Pyrene - 850 Chrysene - 470
S-21A	6-18	134+00, So.	Full -VOA	N.D.
S-21B	18-24	134+00, So.	VOA only	
S-21C	8-9 feet	134+00, So.	Full List	N.D.

TABLE 6 - Continued

SUMMARY OF SEMI-VOLATILE COMPOUNDS DETECTED

Identification Number	Depth (inches)	Location	Parameter	Compounds Detected (ppb)
S-22A	6-18	136+00, So.	Full -VOA	Phenanthrene - 430 Fluoranthene - 880 Pyrene - 880 Benzo(a)anthracene - 490 Chrysene - 780 Benzo(b)fluoranthene - 490
S-22B	18-24	136+00, So.	VOA only	
S-22C	8-9 feet	136+00, So.	Full List	N.D.
S-23A	6-18	138+00, So.	Full -VOA	N.D.
S-23B	18-24	138+00, So.	VOA only	
S-23C	8-9 feet	138+00, So.	Full List	N.D.
S-24A	6-18	140+00, So.	Full -VOA	N.D.
S-24B	18-24	140+00, So.	VOA only	
S-24C	8-9 feet	140+00, So.	Full List	N.D.
S-25A	6-18	142+00, So.	Full -VOA	Chrysene - 440
S-25B	18-24	142+00, So.	VOA only	
S-25C	8-9 feet	142+00, So.	Full List	N.D.
S-26A	6-18	144+00, So.	Full -VOA	N.D.
S-26B	18-24	144+00, So.	VOA only	
S-26C	8-9 feet	144+00, So.	Full List	N.D.
S-27A	6-18	147+00, So.	Full -VOA	Fluoranthene - 1,200 Pyrene - 1,800
S-27B	18-24	147+00, So.	VOA only	
S-27C	8-9 feet	147+00, So.	Full List	N.D.
S-28	6-24	150+00, So.	Full List	N.D.
S-29	6-24	153+00, So.	Full List	N.D.
S-30	6-24	157+00, So.	Full List	N.D.
S-31	6-24	160+00, So.	Full List	Fluoranthene - 2,200 Pyrene - 2,800 Chrysene - 2,700 Benzo(b)fluoranthene - 2,000
S-32	6-24	165+00, So.	Full List	N.D.
S-33	6-24	168+00, So.	Full List	Fluoranthene - 2,600 Pyrene - 2,800 Chrysene - 1,800 bis(2-Ethylhexyl)phthalate - 2,300
S-34	6-24	170+00, So.	Full List	N.D.

TABLE 6 - Continued

SUMMARY OF SEMI-VOLATILE COMPOUNDS DETECTED

Identification Number	Depth (inches)	Location	Parameter	Compounds Detected (ppb)
S-35	6-24	171+00, So.	Full List	Fluoranthene - 1,900 Pyrene - 2,100
S-36A S-36B	6-24 5-6 feet	166+50, So.	Full List	N.D. N.D.
S-37A	6-24*	166+60, So.	Full List Full List	Acenaphthene - 3,700 Fluorene - 3,100 Phenanthrene - 15,000 Anthracene - 5,000 Fluoranthene - 13,000 Benzo(a)anthracene - 9,800 Chrysene - 11,000 Benzo(b)fluoranthene - 6,800 Benzo(k)fluoranthene - 6,700 Benzo(a)pyrene - 5,900
S-37B	5-6 feet		-	N.D.

* Full -VOA = Full list minus VOAs

ppb = parts per billion
N.D. = not detected

gw contamination not related to soil exceedances I would not have requested gw investigation

TABLE 7

TAL METALS GROUNDWATER
µg/L

Parameters	MW-1	MW-2	MW-3	MW-4	New Jersey Groundwater Quality Criteria
Aluminum	1,040	536	1,190	380	200
Antimony	N.D.	N.D.	10.9	N.D.	20
Arsenic	N.D.	N.D.	N.D.	N.D.	8
Barium	N.D.	386	243	N.D.	2,000
Beryllium	N.D.	N.D.	N.D.	N.D.	20
Cadmium	N.D.	N.D.	N.D.	N.D.	4
Calcium	26,600	183,000	144,000	100,000	—
Chromium	N.D.	11.5	N.D.	N.D.	100
Cobalt	N.D.	N.D.	N.D.	N.D.	—
Copper	N.D.	N.D.	27.3	N.D.	1,000
Iron	2,740	12,100	52,900	3,760	300
Lead	11.5	6.2	14.4	11.5	10
Magnesium	6,570	35,100	27,800	46,100	—
Manganese	273	1,460	3,510	2,420	50
Mercury	N.D.	N.D.	N.D.	N.D.	2
Nickel	N.D.	N.D.	55.9	N.D.	100
Potassium	12,900	67,300	21,100	16,100	—
Selenium	N.D.	N.D.	N.D.	N.D.	~~10~~ 50
Silver	N.D.	N.D.	N.D.	N.D.	~~20~~ 2
Sodium	62,900	784,000	420,000	259,000	50,000
Thallium	N.D.	N.D.	N.D.	29.2	10
Vanadium	N.D.	N.D.	N.D.	N.D.	—
Zinc	26.9	N.D.	44.0	N.D.	5,000
Tin	N.D.	N.D.	N.D.	N.D.	—

N.D. = Not detected
— = No standard

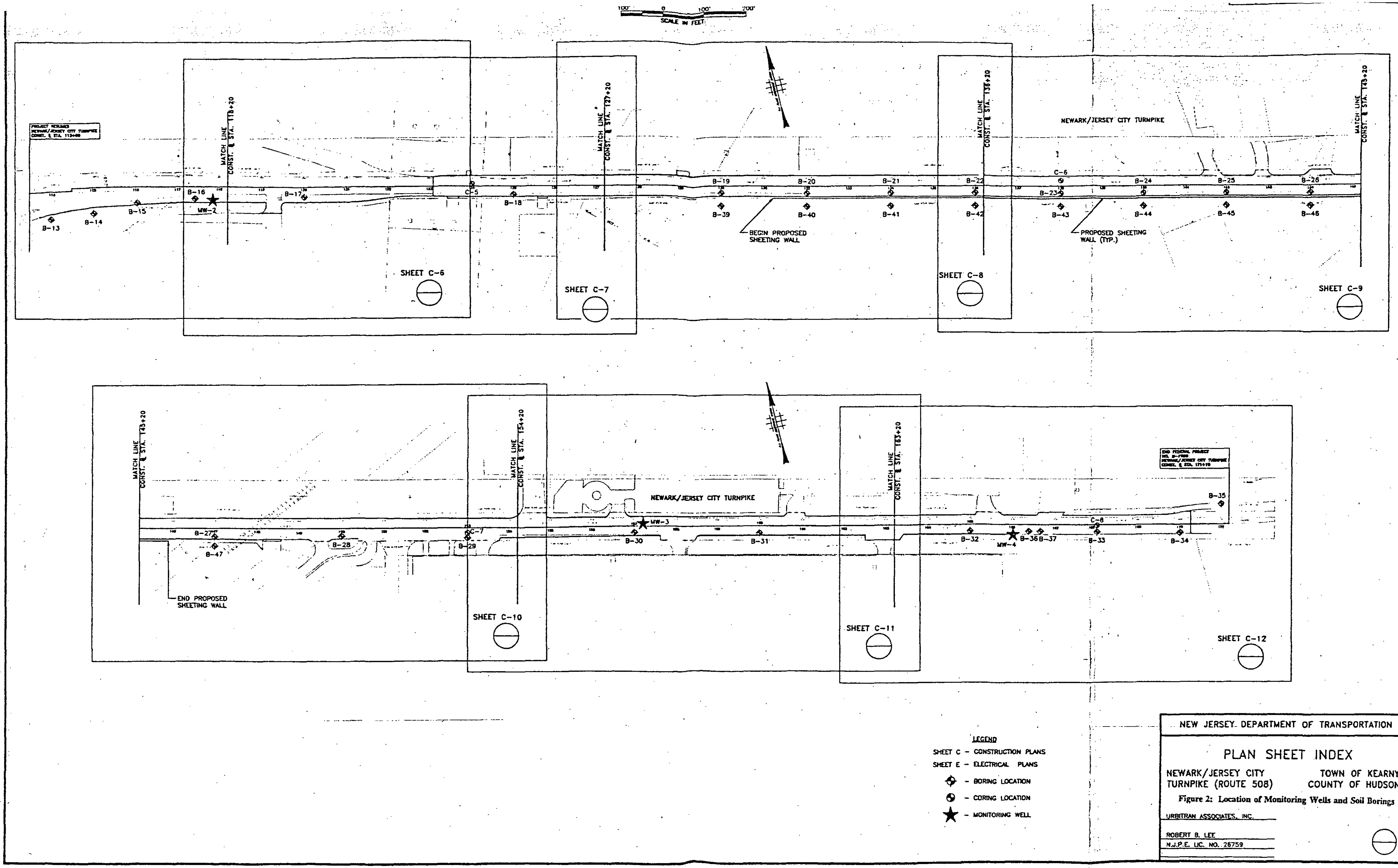
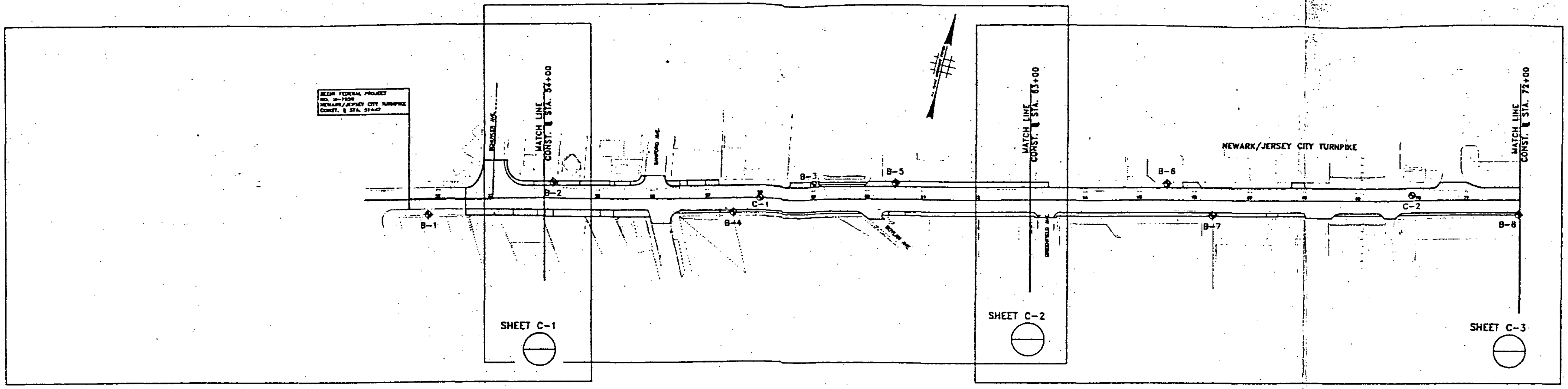
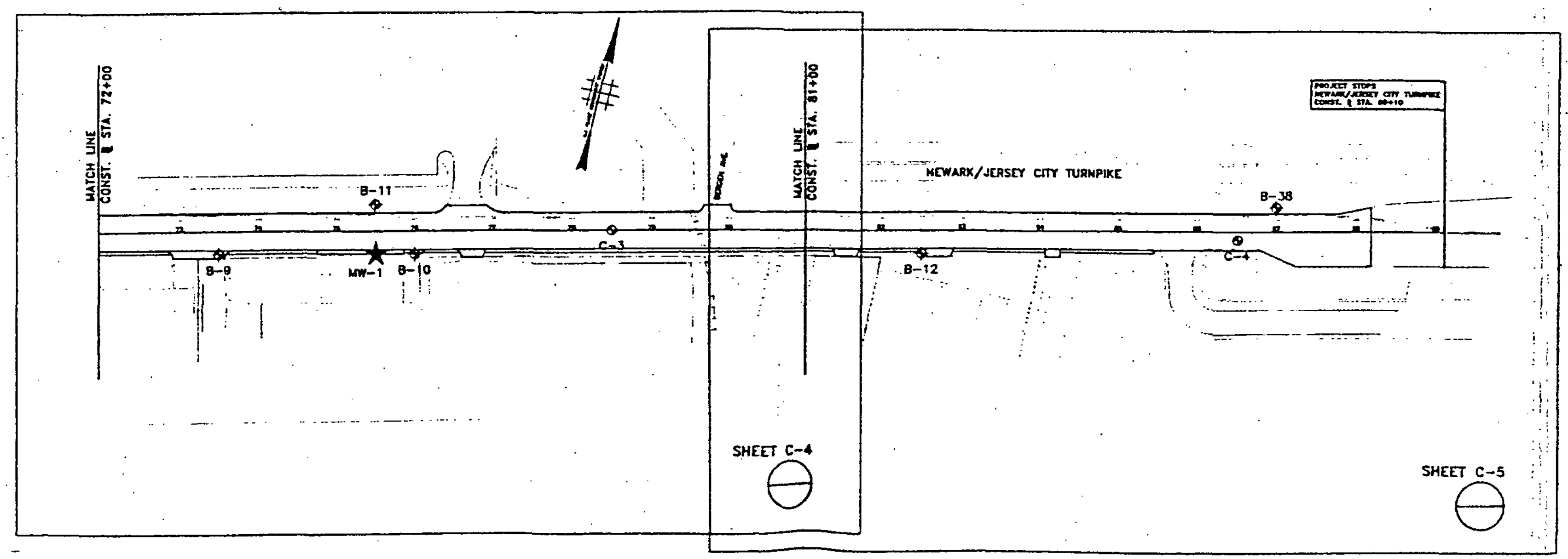


Figure 2: Location of Monitoring Wells and Soil Borings

100' 0 100' 200'
SCALE IN FEET





LEGEND

SHEET C - CONSTRUCTION PLANS
- BORING LOCATION
- CORING LOCATION
- MONITORING WELL

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PLAN SHEET INDEX

NEWARK/JERSEY CITY TURNPIKE (ROUTE 508) — TOWN OF KEARNY, COUNTY OF HUDSON

Figure 2: Location of Monitoring Wells and Soil Borings

URBITRAN ASSOCIATES, INC.

ROBERT B. LEE
N.J. P.E. LIC. NO. 26759

ENERGY AND ENVIRONMENTAL ANALYSTS

55 HILTON AVENUE, GARDEN CITY, NEW YORK

SOIL BORING AND MONITOR WELL REPORT

DATE: 9-6-94 | SHEET 1 OF 1

CLIENT: | BORING NO: S-4

PROJECT LOCATION: Rt 508 New Jersey | PROJECT NO: 94723

REMARKS: STA 57+50 Preston Lines

DRILLING CONTRACTOR: TSDT, Inc. | LOGGED BY: [illegible] | DRILLER: PR

EQUIPMENT	SOIL SAMPLER	AUGER	MONITOR WELL SPECIFICATIONS: CASING	SCREEN	COVER	DRILL RIG / DRILL METHOD
TYPE	SPLIT SPOON	Solid	—	—	—	Tripod Assembly
SIZE	STD 2"	3"				

SURFACE ELEVATION: NA | SURFACE CONDITIONS: Gravel

WATER LEVEL: —

DEPTH	OVA READINGS	SAMPLE NUMBER	SAMPLE DEPTH	MOISTURE	STRATA	SOIL DESCRIPTION & OBSERVATIONS
0	0	S-1	0-2	DRY		Gravel & Sand Surface Gry/Blk F-C SAND some gravel Fill 12"
				DRY	2	Gry/Blk F-M SAND & SILT & GRAVEL Brick/coal ash Fill
5						2ft
10						EOB @ 2ft S-4A 6-18" S-4B 18-24"
15						
20						

ENERGY AND ENVIRONMENTAL ANALYSTS

55 HILTON AVENUE, GARDEN CITY, NEW YORK

SOIL BORING AND MONITOR WELL REPORT

DATE: 9-6-94 | SHEET 1 OF 1

CLIENT: | BORING NO: S-6

PROJECT LOCATION: Rt 508 New Jersey | PROJECT NO: 94123

REMARKS: STA 65+50 N Wilson Chemical

DRILLING CONTRACTOR: TSDT, Inc. | LOGGED BY: LZ | DRILLER: PR

EQUIPMENT	SOIL SAMPLER	AUGER	MONITOR WELL SPECIFICATIONS: CASING	SCREEN	COVER	DRILL RIG / DRILL METHOD
TYPE	SPLIT SPOON	Solid	—	—	—	Tripod Assembly
SIZE	STD 20	30				

SURFACE ELEVATION: — | SURFACE CONDITIONS: Gravel

WATER LEVEL: —

DEPTH	OVA READINGS	SAMPLE INFORMATION: NUMBER	DEPTH	MOISTURE	STRATA	SOIL DESCRIPTION & OBSERVATIONS
0	0	S-1	0-2	dry	2	Gravel .3 Blk/Gry F-M SAND COAL ASH BRICK/GRAVEL SOFT Fill 20" Gry/Blk Silt/Clay Fill 2ft
5						
10						
15						
20						

EOB @ 2ft

S-6A 6-18"

S-6B 18-24"

ENERGY AND ENVIRONMENTAL ANALYSTS

55 HILTON AVENUE, GARDEN CITY, NEW YORK

SOIL BORING AND MONITOR WELL REPORT

DATE: 9-7-94 | SHEET 1 OF 1

CLIENT: | BORING NO: S-7

PROJECT LOCATION: Rt 508 New Jersey | PROJECT NO: 94723

REMARKS: STA 66+40 Drew Chemical

DRILLING CONTRACTOR: TSDT, Inc. | LOGGED BY: NR | DRILLER: PR

EQUIPMENT	SOIL SAMPLER	AUGER	MONITOR WELL SPECIFICATIONS: CASING	SCREEN	COVER	DRILL RIG / DRILL METHOD
TYPE	SPLIT SPOON Solid	Solid	—	—	—	Tripod Assembly
SIZE	STD 2	3 0				

SURFACE ELEVATION: — | SURFACE CONDITIONS: Grass Medium

WATER LEVEL: 3 ft

DEPTH	OVA READINGS	SAMPLE INFORMATION: NUMBER	DEPTH	BLOW CTS / MOISTURE	STRATA	SOIL DESCRIPTION & OBSERVATIONS
0	0	S-1	0-2	6 6		GRASS - TOPSOIL .3
				5 4	1	Blk/Gry COAL ASH/SLAG SOME GRAVEL
	0	S-2	2-4	4 4	3 ▽	WT
				3 5	4	
5	0	S-3	4-6	3 2		Rd Silty Clay w/ COAL ASH
				2 2		
						EOB @ 6ft
10						S-7A 6-18"
						S-7B 18-24"
15						
20						

ENERGY AND ENVIRONMENTAL ANALYSTS

55 HILTON AVENUE, GARDEN CITY, NEW YORK

SOIL BORING AND MONITOR WELL REPORT

DATE 9-7-94	SHEET 1 OF 1
CLIENT:	BORING NO: S-8
PROJECT LOCATION: Rt 508 New Jersey	PROJECT NO: 94123
REMARKS: StA 72+00 S Standard Tallow Site	

DRILLING CONTRACTOR: TSDT, Inc. | LOGGED BY: NR | DRILLER: PR

EQUIPMENT	SOIL SAMPLER	AUGER	MONITOR WELL SPECIFICATIONS: CASING	SCREEN	COVER	DRILL RIG / DRILL METHOD
TYPE	SPLIT SPOON	Solid	—	—	—	Tripod Assembly
SIZE	STD 2"	3"				

SURFACE ELEVATION: —— SURFACE CONDITIONS: Asphalt

WATER LEVEL: ——

DEPTH	OVA READINGS	SAMPLE INFORMATION: NUMBER	DEPTH	MOISTURE	STRATA	SOIL DESCRIPTION & OBSERVATIONS
0	0	S-1	0-2	dry		Asphalt .2
					2	Blk/Brn COAL ASH/SLAG
						2ft EOB @ 2ft
5						
10						S-8A 6-18"
						S-8B 18-24"
15						
20						

ENERGY AND ENVIRONMENTAL ANALYSTS

55 HILTON AVENUE, GARDEN CITY, NEW YORK

SOIL BORING AND MONITOR WELL REPORT

DATE 9-7-94	SHEET 1 OF 1
CLIENT:	BORING NO: S-9
PROJECT LOCATION: Rt 508 New Jersey	PROJECT NO: 94223
REMARKS: STA 73+50 S National Freight	
DRILLING CONTRACTOR: TSDT, Inc. LOGGED BY: [illegible]	DRILLER: PR

EQUIPMENT	SOIL SAMPLER	AUGER	MONITOR WELL SPECIFICATIONS CASING	SCREEN	COVER	DRILL RIG DRILL METHOD
TYPE	SPLIT SPOON	Solid	—	—	—	Tripod Assembly
SIZE	STD 20	3 ø				

SURFACE ELEVATION: — SURFACE CONDITIONS: Grass / dirt

WATER LEVEL: —

DEPTH	OVA READINGS	SAMPLE INFORMATION NUMBER	DEPTH	MOISTURE	STRATA	SOIL DESCRIPTION & OBSERVATIONS
0	0	S-2	0-2			Brn Fine SAND .5 Blk COAL SLAG, CINDERS
					2	Red clay w/ COAL CINDERS
5						
						2 ft
10						EOB @ 2ft S-9A 6-18" S-9B 18-24"
15						
20						

DWR-188 M
12/91

New Jersey Department of Environmental Protection and Energy
Bureau of Water Allocation

MONITORING WELL RECORD

Well Permit No. 26 38150
Atlas Sheet Coordinates ~~26~~ : ~~13~~ : 746

OWNER IDENTIFICATION - Owner HUDSON COUNTY
Address 549 DUNCAN AVE.
City JERSEY CITY State NJ Zip Code 07306

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW-1
County HUDSON Municipality KEARNY TOWN Lot No. NA Block No. NA
Address Newark Jersey City TPK.

TYPE OF WELL (as per Well Permit Categories) MONITORING Date well completed 10, 14, 94
Regulatory Program Requiring Well OWNER INVESTIGATION Case I.D. # N/A
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) EEA Tele. # 516-746-4400

WELL CONSTRUCTION

Total depth drilled 12 ft.
Well finished to 12 ft.
Borehole diameter:
Top 9 5/8 in.
Bottom 9 5/8 in.
Well was finished: ☐ above grade ☒ flush mounted
If finished above grade, casing height (stick up) above land surface N/A ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	0'	2	4	Sch 40 pvc
Outer Casing (Not Protective Casing)	N/A	N/A	N/A	N/A
Screen (Note slot size)	2	10	4	Sch 40 pvc .020
Tail Piece	N/A	N/A	N/A	N/A
Gravel Pack	1	10'	9 5/8	#2 well gravel
Annular Seal/Grout	0	1	9 5/8	Cement Bentonite
Method of Grouting	Tremi with pump			

Static water level after drilling 4 ft.
Water level was measured using Tape drop line
Well was developed for .25 hours at 2.5 gpm
Method of development Hand pump
Was permanent pumping equipment installed? ☐ Yes ☒ No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method Auger
Drilling Fluid N/A Type of Rig Acker AD II
Name of Driller George Thornhill
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. J1306
Name of Drilling Company JERSEY BORING

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 to 5' (FILL) Brick, concrete Sd & gravel
5' to 7' Gry Silt
7' to 12' Gray f/Sand

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature [signature] Date 10/15/94

COPIES: *White & Green - DEPE Canary - Driller Pink - Owner Goldenrod - Health Dept.*

DWR-138 M
12/91

New Jersey Department of Environmental Protection and Energy
Bureau of Water Allocation

MONITORING WELL RECORD

Well Permit No. 26 - 38151
Atlas Sheet Coordinates ~~26~~ : ~~13~~ : 746

OWNER IDENTIFICATION - Owner HUDSON COUNTY
Address 549 DUNCAN AVE.
City JERSEY CITY State NJ Zip Code 07306

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW - 2
County HUDSON Municipality KEARNY TOWN Lot No. NA Block No. NA
Address Newark - Jersey City Tpk.

TYPE OF WELL (as per Well Permit Categories) MONITORING Date well completed 10/13/94
Regulatory Program Requiring Well OWNER INVESTIGATION Case I.D. # N/A
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) EEA Tele. # 516-746-4400

WELL CONSTRUCTION

Total depth drilled 12 ft.
Well finished to 12 ft.
Borehole diameter:
Top 9 5/8 in.
Bottom 9 5/8 in.
Well was finished: ☐ above grade ☒ flush mounted
If finished above grade, casing height (stick up) above land surface N/A ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) (From land surface)	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	0	2	4	Sch 40 pvc
Outer Casing (Not Protective Casing)	N/A	N/A	N/A	N/A
Screen (Note slot size)	2	12	4	Sch 40 pvc .020
Tail Piece	N/A	N/A	N/A	N/A
Gravel Pack	1	12	9 5/8	#2 well gravel
Annular Seal/Grout	0	1	9 5/8	cement / Bentonite
Method of Grouting	Tremi with pump			

Static water level after drilling 5 ft.
Water level was measured using Tape drop line
Well was developed for .25 hours at 2.5 gpm
Method of development Hand Pump
Was permanent pumping equipment installed? ☐ Yes ☒ No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method Auger
Drilling Fluid N/A Type of Rig Acker AD II
Name of Driller George Thornhill
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. J1306
Name of Drilling Company JERSEY BORING

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0' to 4' (Fill) Concrete, Brick wood sand & gravel
4' to 7' organic peat
7' to 12' Red Brn Sand

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature George Thornhill Date 10/15/94

COPIES: White & Green - DEPE Canary - Driller Pink - Owner Goldenrod - Health Dept.

DWR-138 M
1991

New Jersey Department of Environmental Protection and Energy
Bureau of Water Allocation

MONITORING WELL RECORD

Well Permit No. 26 - 38152
Atlas Sheet Coordinates 25 : 13 : 746

OWNER IDENTIFICATION - Owner HUDSON COUNTY
Address 549 DUNCAN AVE.
City JERSEY CITY State NJ Zip Code 07306

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW-3
County ~~HUDSON~~ Municipality ~~KEARNY TOWN~~ Lot No. ~~NA~~ Block No. ~~NA~~
Address Newark-Jersey City Turnpike

TYPE OF WELL (as per Well Permit Categories) ~~MONITORING~~ Date well completed 10/14/94
Regulatory Program Requiring Well OWNER INVESTIGATION Case I.D. # N/A
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) EEA Tele. # 516-746-4400

WELL CONSTRUCTION

Total depth drilled 12 ft.
Well finished to 12 ft.
Borehole diameter:
Top 9 5/8 in.
Bottom 9 5/8 in.
Well was finished: ☐ above grade ☒ flush mounted
If finished above grade, casing height (stick up) above land surface N/A ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	0	2	4	Sch 40 PVC
Outer Casing (Not Protective Casing)	N/A	N/A	N/A	N/A
Screen (Note slot size)	2	12	4	Sch 40 PVC .020 slot
Tail Piece	N/A	N/A	N/A	N/A
Gravel Pack	1	12	9 5/8	# 2 well gravel
Annular Seal/Grout	0	1	9 5/8	Cement/Bentonite
Method of Grouting	Tremi with pump			

Static water level after drilling 5 ft.
Water level was measured using Tape drop line
Well was developed for .25 hours at 2.5 gpm
Method of development Hand pump
Was permanent pumping equipment installed? ☐ Yes ☒ No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method Auger
Drilling Fluid N/A Type of Rig Acker AD II
Name of Driller George Thornhill
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. J1306
Name of Drilling Company JERSEY BORING

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0' to 5' (FILL) wood, Brick, Concrete Sand & gravel
5' to 7' organic peat
7' to 12' Brn Sand

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature [signature] Date 10/15/94

COPIES: White & Green - DEPE Canary - Driller Pink - Owner Goldenrod - Health Dept.

DWR-138 M
12/91

New Jersey Department of Environmental Protection and Energy
Bureau of Water Allocation

MONITORING WELL RECORD

Well Permit No. 26 - 38153
Atlas Sheet Coordinates ~~26~~ : ~~13~~ : 746

OWNER IDENTIFICATION - Owner HUDSON COUNTY
Address 549 DUNCAN AVE.
City JERSEY CITY State NJ Zip Code 07306

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW-4
County HUDSON Municipality KEARNY TOWN Lot No. NA Block No. NA
Address Newark-Jersey City Tpk.

TYPE OF WELL (as per Well Permit Categories) MONITORING Date well completed 10/14/94
Regulatory Program Requiring Well OTHER INVESTIGATION Case I.D. # N/A
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) EEA Tele. # 516-746-4400

WELL CONSTRUCTION

Total depth drilled 12 ft.
Well finished to 12 ft.
Borehole diameter:
Top 9 5/8 in.
Bottom 9 5/8 in.
Well was finished: ☐ above grade ☒ flush mounted
If finished above grade, casing height (stick up) above land surface N/A ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) (From land surface)	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	0	2	4	sch 40 pvc
Outer Casing (Not Protective Casing)	N/A	N/A	N/A	N/A
Screen (Note slot size)	2	12	4	sch 40 pvc .020 slot
Tail Piece	N/A	N/A	N/A	N/A
Gravel Pack	1	12	9 5/8	#2 well Gravel
Annular Seal/Grout	0	1	9 5/8	cement / Bentonite
Method of Grouting	Tremi with pump			

Static water level after drilling 5 ft.
Water level was measured using Tape drop line
Well was developed for .25 hours at 2.5 gpm
Method of development HAND PUMP
Was permanent pumping equipment installed? ☐ Yes ☒ No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method Auger
Drilling Fluid N/A Type of Rig Acker AD II
Name of Driller George Thornhill
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. J1306
Name of Drilling Company JERSEY BORING

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0' to 5' (FILL) wood, Brick, Concrete Sand & gravel
5' to 10' Red Brn Sand
10' to 12 organic peat

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature [signature] Date 10/15/94

COPIES: White & Green - DEPE Canary - Driller Pink - Owner Goldenrod - Health Dept.

REMEDIATION PLAN
CONTAMINATED SOIL REMOVAL
NEWARK/JERSEY CITY TURNPIKE
ROADWAY IMPROVEMENT PROJECT

Prepared for:

URBITRAN ASSOCIATES, INC.

and

THE COUNTY of HUDSON

Prepared by:

EEA, *Inc.*
55 Hilton Avenue
Garden City, New York 11530
(516) 746-4400
(212) 227-3200

MARCH 1996

Project: 94723

1. DESCRIPTION OF THE PROJECT

The improvement program calls for the widening of the Turnpike from 40 feet to 46 feet. The west section widening will extend three feet on each side of the current roadway (from Sta. 52+53 to Sta. 88+19). The east section will be widened 6 feet to one side (on the south from Sta. 123+08± to Sta. 166+00±, on the north side from Sta. 166+00± to Sta. 170+25±. All of the widening occurs within the 66-foot right-of-way (ROW).

The western terminus is Schuyler Avenue (M.S. 1.218), located at the boundary of the Town of Harrison and the Town of Kearny, and the eastern terminus is the Route 7 (Belleville Turnpike) Interchange (M.P. 3.485) in the Town of Kearny, Hudson County. The four-lane section, bounded by the I-280 Interchange (M.P. 1.930) and the New Jersey Turnpike (M.P. 2.395), is excluded from this project. The project length is approximately 1.8 miles (see Figure 1, location map) and Exhibit A.

2. SUBSURFACE INVESTIGATION

A subsurface investigation was conducted at 37 locations within the area of concern. Multiple soil samples were obtained. The results are documented in detail in the Subsurface Investigation Report prepared by EEA, Inc. (January 1995)

At the following locations (see Table 1), the soil samples obtained from the boring had levels of contamination that exceed the New Jersey Soil Cleanup Criteria (non-residential, direct contact) and are classified as ID-27 (non-hazardous industrial waste). A total of 1,641 cubic yards of material will require special disposal and/or special handling.

RECEIVED
MAR 25 1996
URBITRAN, N.J.

TABLE 1

TABULATION OF SOILS REQUIRING DISPOSAL AS ID-27

	Length	W x H	Classification	Volume
S-3	375	4 x 2	ID 27	111.1
S-6	325	4 x 2	ID 27	96.3
S-17	325	20 x 3 15 x 2	Haz	433
S-19	500	8 x 2	ID 27	296
S-24	200	12 x 2	ID 27	178
S-21	200	13 x 2	ID 27	193
S-37	75	2 x 2	ID 27	11.0
S-16	75 125	16 x 3 20 x 3	ID 27 ID 27	45.3 278
Total				1,641.7 CY

OTHER CRITERIA*

	Length	W x H	Classification	Volume
S-32	250 75	2.5 x 2 1 x 2	Excess Chromium	52 CY

* There is no cleanup criteria for total Chromium. However, the levels are considered to be high

At one boring location (S-17), lead exceeds the TCLP regulatory criteria for a hazardous waste. Elevated levels of PCBs were detected, as well as elevated levels of semi-volatile compounds. The soils in this area will have to be stock piled separately, retested and classified prior to disposal. It is estimated that as much as 500 cubic yards of material are located at S-17.

The attached drawing presents the locations of soil that will require special disposal practices after excavation from the right-of-way.

(NO DRAWING IN FILE)

3. RECOMMENDED REMEDIATION

The recommended remediation consists of stock piling the excavated soils from the areas identified as exceeding ID-27 classifications and obtaining soil samples for laboratory analysis. The purpose of the testing is to confirm that the in-situ borings are representative of the stock piled soils. The number of soil samples requiring testing from the excavated areas is related to the amount of soil stock piled. The table below is a guide in determining the appropriate number of soil samples requiring testing. Each soil sample should be tested as following:

- Semi-volatiles (USEPA Method 8270)
- RCRA Metals (USEPA Method SW-846)

RECOMMENDED NUMBER OF SOIL PILE SAMPLES

Contaminant	Semi-Volatiles (USEPA Method 8270)		RCRA Metals	
Sample Type	Grab	Composite	Grab	Composite
Soil Quantity $(yd)^3$				
0-50	1	1	1	1
50-100	1	2	2	1
100-200	1	3	3	1
200-300	1	4	4	1
300-500	2	5	5	2

After the soils are retested, the soils can be transported to the Hackensack Meadowland Development Landfill for final disposal.

At Location S-17, the soil samples will be tested for TCLP, lead, and semi-volatiles, as well as the other parameters identified above. After testing, if the soil at Location S-17 is still considered hazardous, the soil will be shipped to a licensed hazardous waste landfill.

State of New Jersey
Christine Todd Whitman
Governor
Department of Environmental Protection
Robert C. Shinn, Jr.
Commissioner
Division of Responsible Party Site Remediation
Bureau of Field Operations - Northern
2 Babcock Place
West Orange, New Jersey 07052

Urbitran
2 Ethel Road, Suite 205B
Edison, New Jersey 08817
Att: John Brennan, Project Manager

Sub: Newark/Jersey City Turnpike
Project at the Intersection of
County RD. 508 & NJ Turnpike
Kearny, Hudson County

May 13,1996

Dear Mr. Brennan:

This office has received and completed its review of the Draft Declaration of Environmental Restriction (DER) submitted by cover letter dated April 4,1996 for the referenced project. Consistent with our past conversations on this issue, this office finds the draft DER acceptable for the project. This office will require a copy of the recorded DER, stamped by the County, prior to closure of the case.

If you have any questions, please contact me at (201)669-3960.

Sincerely,

Gary Greulich
Principal Env. Specialist

c: File

C5. Kearny 2 Landfill

Part of KEARNY Meadows

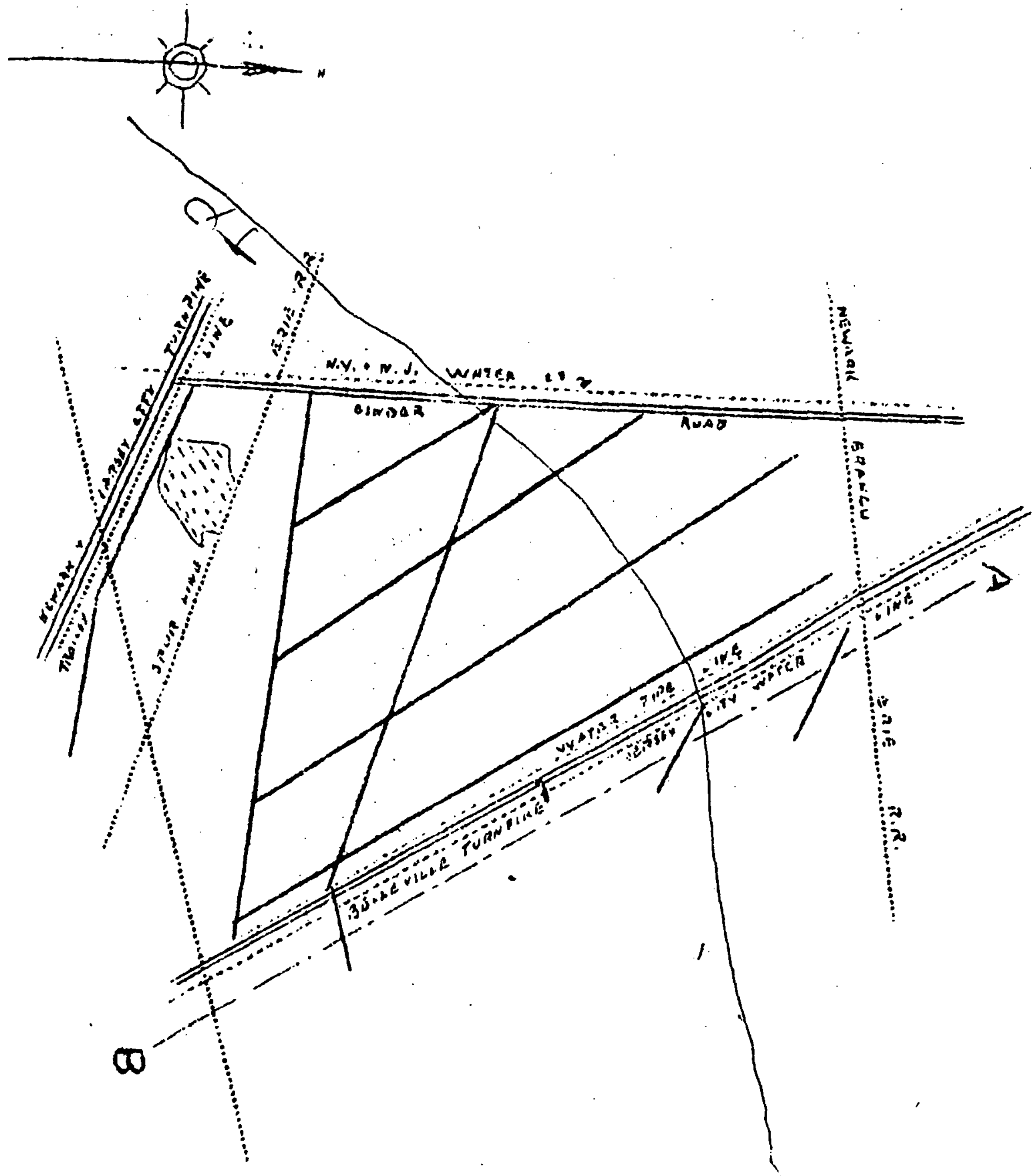
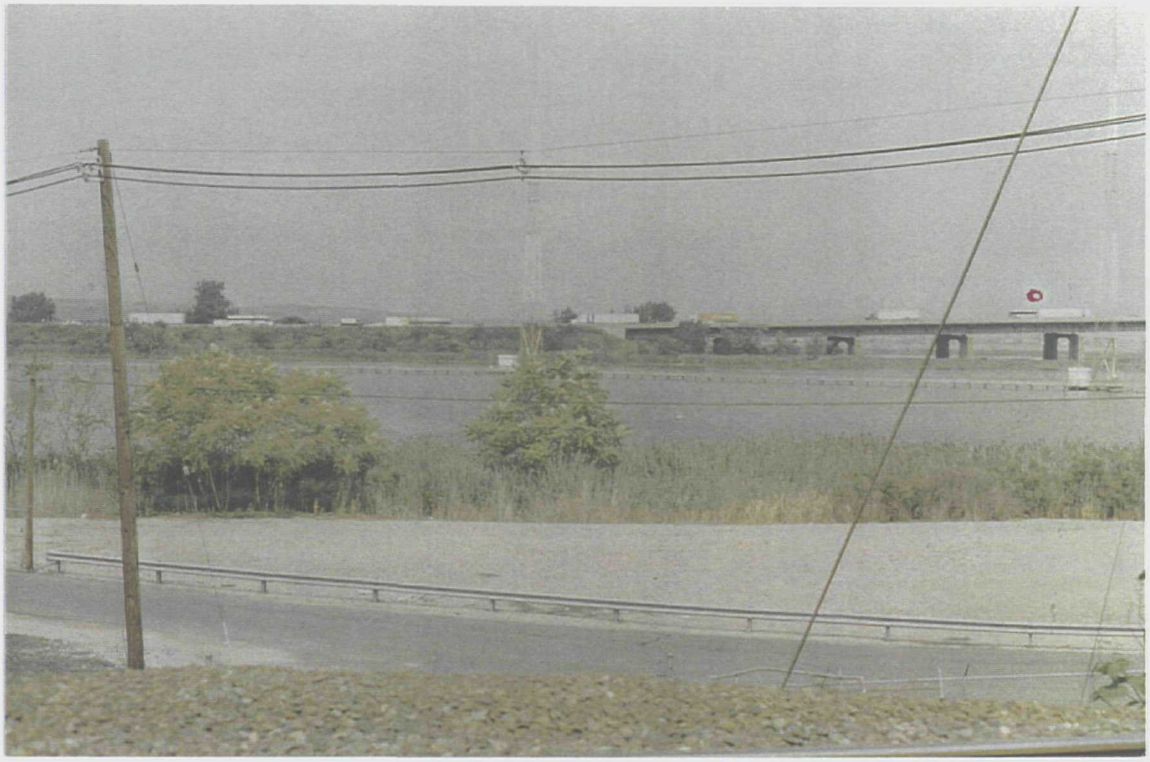


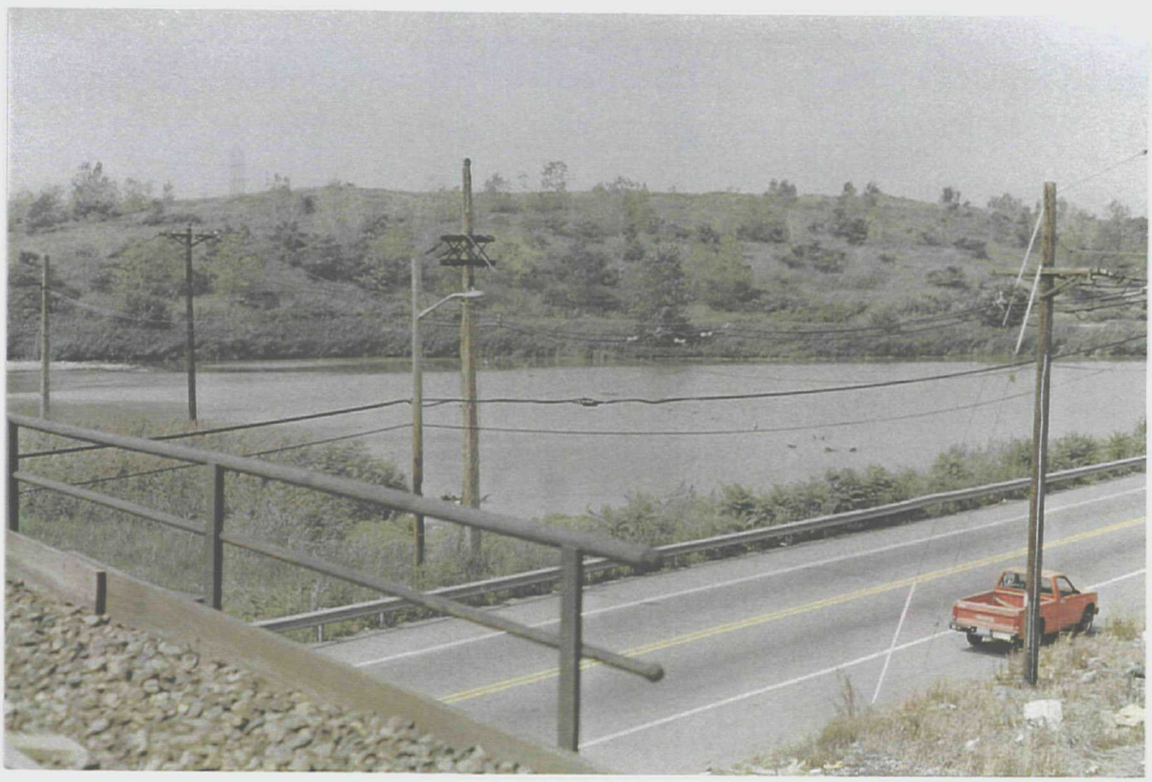
Plate III - Sec. 3

Scale 800 feet to the inch
APRIL 1938

NJ TURNPIKE AND KEARNY 2 LANDFILL



Open water at north end of Turnpike sand drain system.



Open water at foot of Kearny 2 landfill, north side.

O. J. PORTER and L. C. URQUHART, Members ASCE

Porter-Urquhart Associated, Consulting Engineers, New York, N.Y., and Newark, N.J.

Sand drains expedited stabilization of marsh section

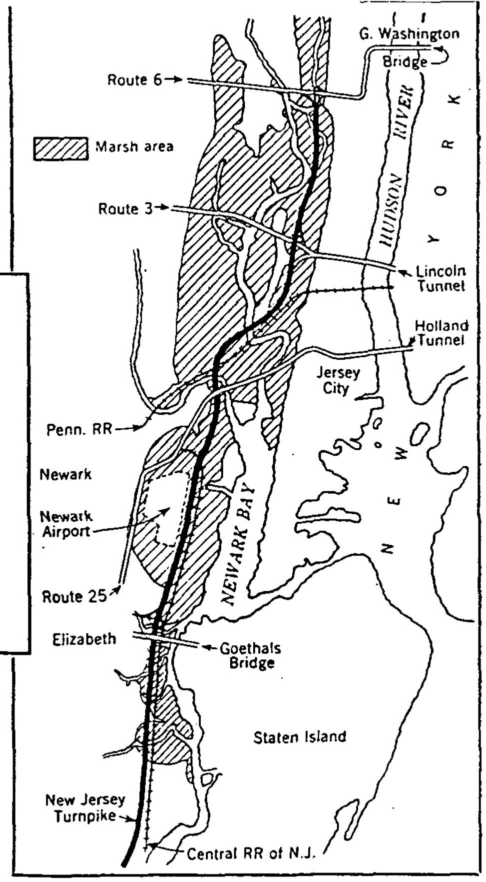


FIG. 1. IN SECTION of Turnpike that crosses New Jersey Meadows, original foundation consisted of wet silt and mud to depths up to 250 ft. In this section 20,000,000 cu yd were stabilized.

A LONG SECTION at the northern end of the Turnpike was routed over the New Jersey Meadows (Fig. 1). This route was chosen to avoid heavily built-up industrial and residential areas in Newark, public institutions in Hudson County, a second crossing of the Hackensack River, and other residential areas. The Meadows are a geological formation consisting of deposits of mud and silt with a high water content, varying in depth from a few feet to 250 ft.

Several methods have been used for the construction of roads and other structures on mud of this type:

1. Where the mud is shallow (5 or 6 ft deep) an excavation and backfill method usually has proved adequate. This method has been used for depths of mud up to 20 ft or more but at relatively high costs.

2. A more economical method, utilized extensively across shallow mud on the Turnpike, is to cover the meadow with free-draining sand [illegible] 4 ft in depth and then to superimpose an overload fill on this sand to obtain rapid consolidation and stabilization during construction.

3. A third method is the sand-drain method, which may prove economical for any depths exceeding 10 [illegible]

Where the cost of fill is low and disposal areas for the mud are readily available without excessive haul, the first method listed—excavation and backfill—often can be used economically. On the northern section of the Turnpike this method did not prove generally desirable even where the mud was shallow because fill costs were high and disposal areas were difficult to obtain. On a section between the Rahway River and Morse's Creek, a distance of 1.10 miles, where the depth of mud varied from 15 to 25 ft, alternate bids were taken on this method and the sand-drain method. The latter showed a saving of nearly one million dollars.

During the preliminary and design studies for the northern part of the Turnpike, approximately 800 test holes ranging up to 212 ft in depth and aggregating 29,443 lin ft, were made to obtain samples for analyses of the more than 40,000,000 cu yd of marsh mud encountered. Because of the variation in the character of the mud deposits, about 18,000 samples were tested for moisture content or density in order to classify the various strata. About 350 representative samples were tested for consolidation and permeability, and 175 for strength by triaxial methods at various stages of consolidation.

The studies of these tests, supported by past experience, indicated that it would be necessary to stabilize about 20,000,000 cu yd of mud and soft silt and clay to obtain rapid consolidation and settlement of the roadway embankments in the short period allowed for construction. All three methods listed above were used, but the third method was the principal one, utilizing about 5,000,000 lin ft of vertical sand drains which ranged from 12 to 100 ft in depth.

Sand-Drain Method Used Extensively

Previous work for the New Jersey State Highway Department—on Route 3 at Secaucus, Route 35 at Point Pleasant, Route 100 in Linden and at other places—had proved the efficacy of consolidation and stabilization of the subsurface material by the use of vertical sand drains. It was decided, therefore, that this method could be used successfully for the construction of the Turnpike across the Meadows.

Many possible alignments north of the Hackensack River in the vicinity of Laurel Hill were studied in an endeavor to locate the Turnpike where the mud was shallowest. Our subsurface explorations indicated that the Pennsylvania Railroad had years ago selected the best possible location and that we should parallel its alignment until the Turnpike turns northwest to cross the shallower marshes adjacent to the Secaucus Hills. The adoption of this alignment saved many hundreds of thousands of dollars over alternate locations previously considered which traversed the very deep mud deposits near the center of the New Jersey Meadows between the Secaucus Hills and the Lincoln Tunnel approaches.

The order of procedure used in the sand-drain method of consolidation on the Turnpike is shown in Fig. 2. In general, it was as follows:

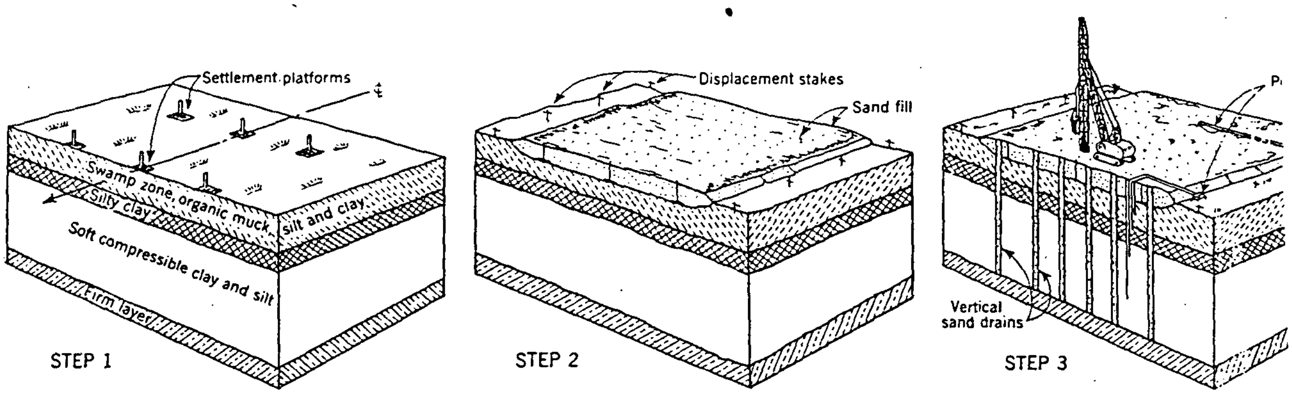
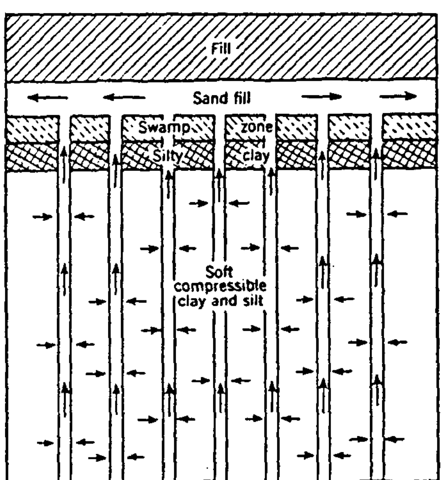


FIG. 2. SEQUENCE OF FILL STABILIZATION by vertical sand-drain method involved following steps: STEP 1: Settlement platforms are placed on original meadow surface. STEP 2: Porous sand fill is placed on meadow surface and displacement stakes are set. STEP 3: Vertical sand drains are installed thro material up to 100-ft depth, and pore-pressure measuring are set at various depths. Remaining steps are illust opposite page.

Step 1. To check the rate of stabilization during construction and to measure the amount of fill actually deposited for contract payments, 1,660 settlement platforms were installed before the blanket was placed. These platforms consisted of either a timber or steel-plate rectangle, approximately 3 ft × 3 ft. To each platform a pipe was attached which extended upward through the fill. Extensions to this pipe were added as the fill was built up. At various elevations in the mud foundations, 450 pore-pressure devices were set up so that the effect of the fill load on the underlying strata could be closely watched. In addition, about 500 control stakes were placed at the sides of all fills, and in the meadow some distance from the toe of the fill, to indicate any sidewise movement. Such movement, if it became excessive, could develop into a mud wave, and cause collapse of the fill.



Step 2. A sand blanket 3 ft or more in depth was placed on the surface of the Meadow. The material composing such a blanket must be a free-draining sand containing a minimum of fine particles. The specifications for this blanket on the Turnpike required that 100 percent of the material pass the $2^1/_2$-in. sieve; that from 60 to 100 percent pass the $^1/_2$-in. sieve; and that, of the material passing the No. 4 sieve, not more than 20 percent pass the No. 80 sieve, and not more than 2 percent the No. 200 sieve.

Because the material for the sand blanket lacked fines, it furnished a generally loose and unsatisfactory working surface for heavy equipment. Contractors were therefore permitted to deposit gravelly material containing up to 15 percent of fines on the blanket to a depth of from 1 to 2 ft, and to compact it sufficiently to form a working table for the sand-drain equipment. Some contractors placed mats on the sand blanket for their equipment rather than the finer material allowed by the specifications.

Step 3. With pile-driving ment, a closed-end mandrel fı to 20 in. in diameter, as specifie driven through the working the sand blanket, and the lying Meadow material to stratum. The mandrel was with sand and then gradually drawn while the sand was out through the opened bott the mandrel by air pressure a on top of the sand. Thus t pressure held the sand in place hole while the mandrel was drawn. The sand-drain m was required to be free drain character, even coarser tha sand blanket, but no large pa were permitted. Through sand drains the water in the lying material percolated u to the sand blanket, as is sho Fig. 3.

The depth to which the drains should be driven, an amount of settlement to be exp in the underlying material, we timated from previous subs explorations, including soil sa taken at several elevations. depth to which the sand d should be driven was again ch during the driving, and inspe were instructed to have the dr continued until a specified nu of blows per foot was require penetration.

FIG. 3. VERTICAL SAND DRAINS—to about 5,000,000 lin ft—were driven into formation in New Jersey Meadows section of route. Under load of fill water was p from compressible material and escaped through sand drains. In period of a few w marsh settled to stable load-bearing condition.

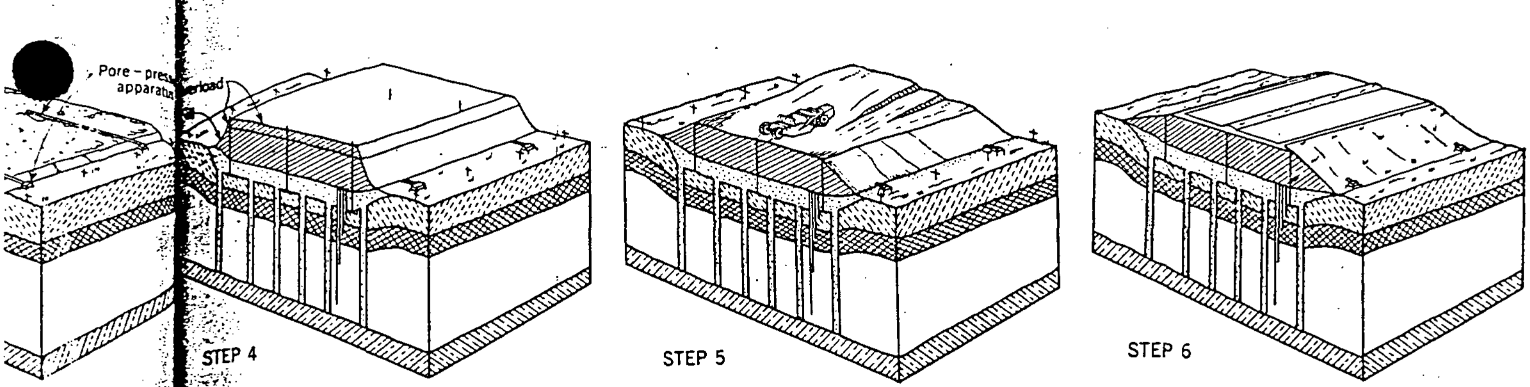


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FIG. 2 (Continued). STEP 4: Overload material is placed in controlled increments, depending on gain in strength of marsh material as determined by readings of field instruments and soil laboratory tests. STEP 5: After consolidation, overload fill is removed and utilized to provide for future widening of Turnpike or to fill in service and interchange areas. Final stabilized roadway is shown in STEP 6. Pore-pressure devices and settlement platforms are left in place for permanent record.

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Step 4. After completion of the sand drains, fill material was gradually deposited and compacted in thin layers on top of the working table. Close control of the placing of this fill was exercised, and if high pore pressures or excessive sidewise movement were observed, the placing of fill was temporarily discontinued until sufficient consolidation had taken place.

Fills were built up to the final profile grade, above which from 2 to 8 ft of overload fill was placed. In the vicinity of bridge abutments, where speed of consolidation was necessary, overloads of fill as high as [illegible] ft were used. At some locations fills as high as 60 ft, including overload, were placed on top of sand drains.

As the fill increased in height, its weight tended to compress the underlying material more and more, forcing the water from the mud into the sand drains, and then up into the sand blanket, whence it drained off into the adjacent meadows. After the fill reached the overload grade, in spite of the necessity of complying with the fast completion schedule for the Turnpike, a period of several weeks was insisted on in order to obtain stabilization of the underlying meadow mud. Longer [illegible] were provided where possible and would generally have been [illegible]able had time permitted, to accomplish more complete stabilization [illegible] reduce future maintenance [illegible]

[illegible] length of the stabilization [illegible] varied at different locations and [illegible] finally determined by continuous [illegible] of the settlement platforms. [illegible] typical settlement curves, see [illegible] right.

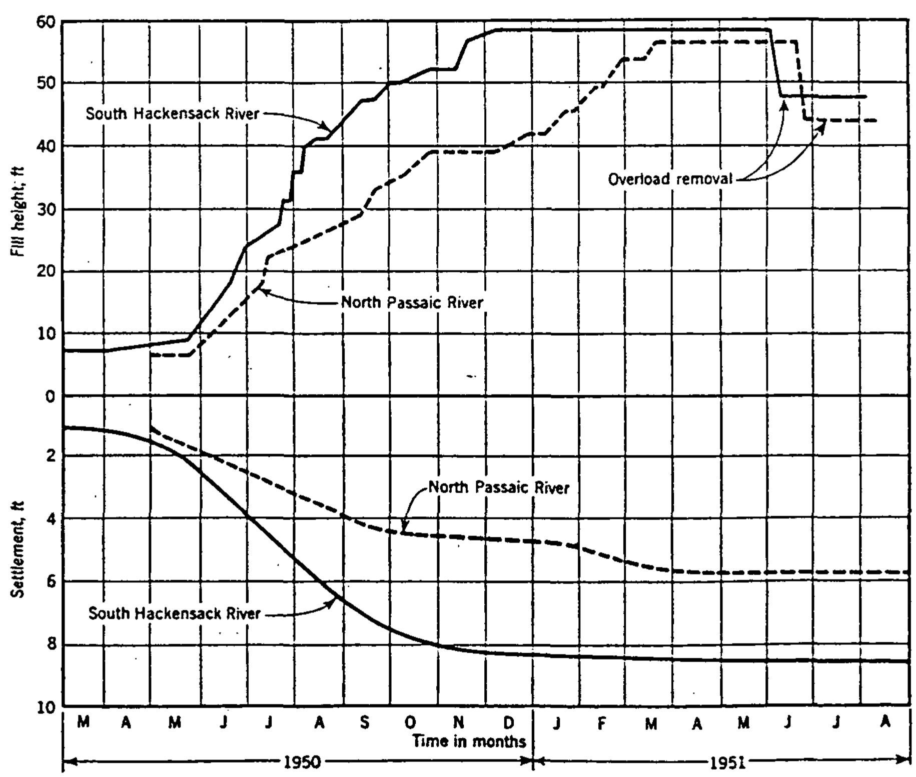
Step 5. When the settlement curves showed a definite tendency to flatten out, it was known that stabilization was nearing completion, and that the date for the safe removal of the overload, to allow for the construction of bridge abutments and paving, could be set. Settlement and pore-pressure readings were taken semi-weekly; they totaled over 100,000 readings. Pore pressures were closely watched to make sure that the superimposed fill was not being carried too largely on the water within the mud, a situation that would have caused blowouts and mud waves.

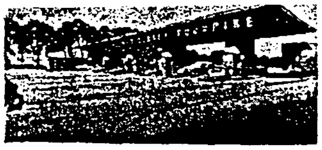
Step 6. After stabilization of the underlying strata and removal of the overload fill, the grade was ready for pavement construction.

Examples Show Good Consolidation

An interesting example of the consolidation effected by the sand-drain method is provided by experience at the old railroad yard at the Esso Standard Oil plant in Linden.

FIG. 4. CAREFUL READINGS of pore pressure and fill settlement, 100,000 in all, showed when settlement was about complete. Typical settlement curves are shown below.





Although the fill over this area had been in place for more than fifty years, and had carried continuous traffic during that time, when sand drains were driven and the fill and overload placed for the Turnpike, a settlement of $3^1/_2$ ft occurred in a depth of mud of 15 ft or less.

Another striking example of the consolidation of the underlying meadow material, obtained by means of sand drains and overload, was furnished by a contractor's experience in building bridges across Paunpeck Creek and Bellman's Creek on the Turnpike north of Route 3. At each of these locations, the creek flow was diverted through temporary corrugated metal pipes, and the whole area surrounding the piers and abutments was given sand-drain treatment. In driving the 14-in.-dia sand drains, once the sand blanket had been penetrated, one to five blows of the hammer per foot were required at both sites.

After stabilization, at Paunpeck Creek, the excavation was carried down to El. −20 ft inside a sheet-pile cofferdam. Here the contractor experienced such difficulty in driving the sheetpiling through the consolidated material that he decided to substitute a well-point system without sheetpiling at Bellman's Creek. At both locations 12-in. closed-pipe piles were driven with a No. 11 McKiernan-Terry hammer to depths varying from 120 to 180 ft to support the bridge piers and abutments. The driving records show that from 20 to 25 blows per foot were required to penetrate the consolidated material.

North of Morse's Creek the Turnpike passes through the Standard Oil Company's refinery. As it was realized that this would be a difficult section, involving the relocation and construction of a new storage yard, it was the first contract let by the New Jersey Turnpike Authority. The successful bidder was Porier & McLane of New York.

In addition to stabilization of a considerable length of meadow underlying the refinery, up to depths of 25 ft, this job also required relocation and protection of numerous boat lines, several 60-in. salt-water cooling lines, and various other utilities of the Standard Oil Company which, in their final location, would have to cross under the Turnpike. Uninterrupted operation of these pipelines was required to avoid a shutdown of the refinery. At this site sand drains to a total length of 198,800 lin ft were driven at a bid price of $1.00 per ft, and 500,000 cu yd of fill was hauled 46 miles by railroad, rehandled, and placed at a bid price of $1.60 per cu yd.

Between the Central Railroad of New Jersey crossing in Elizabeth and Raymond Boulevard, a distance of 5.85 miles, about 40 percent of the mud was shallow enough to be stabilized by laying an overloaded pervious blanket without any sand drains. At the crossing of three railroads, at a point known as the Oak Island Yard, this method was used with heights of fill exceeding 60 ft. On the remaining 60 percent of this section, sand drains 12 to 35 ft in length were required to stabilize the existing mud layers for the support of embankments ranging up to 40 ft in height. Most of the fills in this area were placed hydraulically up to a height of 65 ft by Construction Aggregates Corp. and Peter Kiewit & Sons Co. They attained a record rate of 750,000 cu yd in one month.

Some Cost Figures for Sand Drains and Fill

In this 5.85-mile length of the Turnpike, 867,000 lin ft of sand drains were installed on roadways and interchanges at an average price of 55 cents per ft, and 4,390,000 cu yd of fill were placed at an average price of $1.63 per cu yd. This fill was dredged from Jamaica Bay, Ambrose Channel and Sandy Hook and transported by dredges and scows to the basin in Newark Bay, whence it was pumped distances up to 17,000 ft to final location.

North of the Passaic River, very deep mud was encountered except in areas near Laurel Hill and short stretches in Secaucus. From the Passaic River to the Susquehanna crossing, a distance of 6.82 miles, the contractor was George M. Brewster & Son, of Bogota, N. J. His contracts involved the construction of 2,781,500 ft of sand drains at a bid price ranging from 40 cents per lin ft for the longer drains to 85 cents for the shorter ones, and the placement of 5,208,000 cu yd of dry fill at an average bid price of $1.57 per cu yd. This contractor made several progress records, among them the placing of 6,200 lin ft of sand drains with one rig in an eight-hour shift; and the placing of 997,000 cu yd of fill in one month using 300 trucks and ten shovels. Some of this fill was hauled 37 miles by rail, and truck hauls varied up to 25 miles.

North of Route 3 a layer of [illegible]paratively stiff material from [illegible] 10 ft thick was encountered fr[illegible] to 20 ft below the surface. [illegible] this, soft silty material extend[illegible] great depths. To avoid great [illegible]tional expense for driving [illegible] drains 100 ft or more in depth, [illegible]peared that low fills over this [illegible] could be carried on this subst[illegible] overlying crust. Only the [illegible]terial above this crust was tr[illegible] with sand drains, and the [illegible] through the area was raised fr[illegible] to 2 ft to allow for possible s[illegible]ment during the next fifty y[illegible] However, at bridge approache[illegible] meadow was treated with [illegible] drains to depths of from 70 to 1[illegible] The same methods of treatment [illegible] applied to cross the deep mu[illegible] 'neath the ramps to the Li[illegible] Tunnel.

From the New York, Susqueh[illegible] & Western Railroad crossin[illegible] Route 6, a distance of 0.94 [illegible] layers of deep soft mud were [illegible]countered. This section also [illegible]volved many difficult constru[illegible] and stabilization problems to [illegible]guard sewer lines, approaches t[illegible] railroad, the Overpeck Creek br[illegible] and traffic on Route 6 at the n[illegible]erly interchange of the Turn[illegible] Stabilization on this section, inv[illegible]ing 890,000 lin ft of sand d[illegible] ranging up to 100 ft in depth, [illegible] bid price varying from 45 to 70 c[illegible] per lin ft, was completed by [illegible] Union Building & Construction [illegible] of Passaic, N. J., with the top [illegible]ord of 15,288 lin ft of sand dr[illegible] driven with two rigs in two ei[illegible]hour shifts.

In the Passaic-Hackensack [illegible] fills 40 ft high were built for br[illegible] approaches. Based on con[illegible] prices, the cost of these fills, inc[illegible]ing sand-drain treatment, pav[illegible] drainage, and other facilities, [illegible] something less than $800 per l[illegible] of Turnpike. Adjacent structu[illegible] on the other hand, cost a[illegible] $1,300 per lin ft.

Future widening of this sectio[illegible] the Turnpike to a dual-dual type [illegible] require the construction of a [illegible] structure at an additional cos[illegible] $1,300 per ft, on the basis of pres[illegible] day contract prices. However, [illegible]ture widening of the fill area for [illegible] purpose will cost only $400 pe[illegible] since in the initial design provi[illegible] was made, immediately adjacen[illegible] the structures, for a part of such [illegible]ture widening. This was done [illegible] avoid future placement of heavy [illegible]bankment loads near the exis[illegible] abutments. If this provision had been incorporated in the design,

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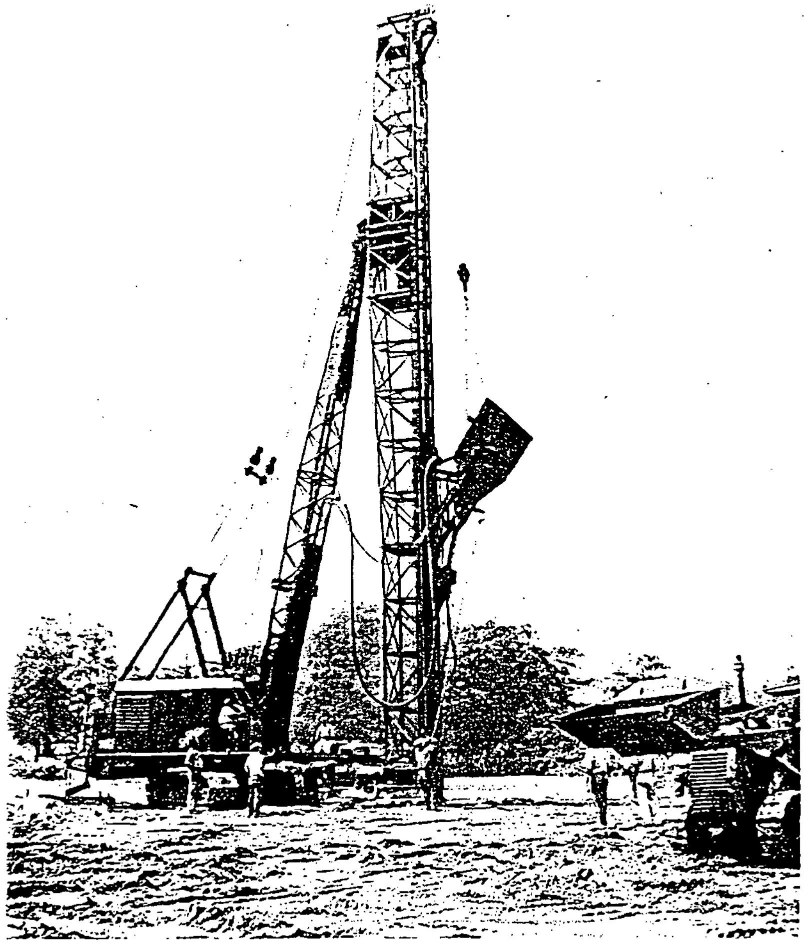
cost of $800 per lin ft for the initial construction would have been considerably less.

The saving in both money and critical materials realized by using fills instead of structures would be even larger if fill material could be obtained at a lower price. On these projects fill averaged $1.62 per cu yd, with a range of from $1.20 to $1.85.

Embankment construction over the New Jersey Meadows, including the sections constructed by the New Jersey Highway Department, involved the placement of about 15,000,000 cu yd of fill. The quantities actually required were very close to the original estimates submitted to the New Jersey Turnpike Authority in September 1949, while the cost of the embankment work, including stabilization, was appreciably below those estimates.

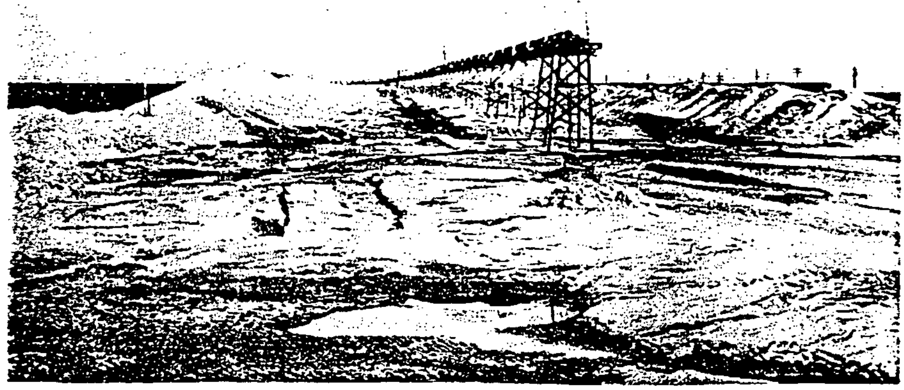
Preliminary alignment studies over marsh land for Route 100 had been made by the New Jersey Highway Department from Woodbridge to Route 3. Much of the grading work was either completed or under contract from the Rahway River to Morse's Creek prior to the creation of the New Jersey Turnpike Authority. The preliminary engineering studies to determine the location and cost of the Turnpike from Bonhampton to the northern end were conducted for the New Jersey Turnpike Authority by Ammann & Whitney, Edwards & Kelcey, Frederic R. Harris, Inc., and O. J. Porter & Co. Their report recommended the incorporation of that portion of Route 100 between the Rahway River and Morse's Creek as a part of the New Jersey Turnpike, and this was done.

The engineering work for the design and construction of the roadways and interchanges of the Turnpike from Morse's Creek to Route 6 was done by Edwards & Kelcey, Frederic R. Harris, Inc., and O. J. Porter & Co. Grading, stabilization and pavement were assigned to the latter engineering firm with Mr. Porter, M. ASCE, as Assistant Project Manager and Mr. Urquhart, M. ASCE, as Assistant Chief Engineer in charge. The staff of the latter included J. E. Cowles as Contract Engineer on the northern section and L. J. Stephenson, M. ASCE, on the southern section. Resident engineers on the grading work between Elizabeth and Secaucus were K. S. Kelly and P. C. McCallum. Bruce McCreary, Assoc. M. ASCE, and R. S. Bodwell of O. J. Porter & Co., assisted with the design and supervision of the stabilization and grading work.



THIS SAND DRAIN RIG is typical of others used for placing drains through deep mud formations of Jersey Meadows section of Turnpike. With leads as high as 115 ft, mandrels up to 90 ft long were driven. Each hole was filled with sand, which was held down by air pressure while mandrel was withdrawn.

LARGE QUANTITIES of sand fill in Port Newark area were placed hydraulically. Sand was hauled from Atlantic Ocean shore areas by barge and dredge. Hydraulic fill was brought to construction site through pipes similar to one shown below.



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HACKENSACK MEADOWLANDS DEVELOPMENT COMMISSION

SITE I-A LANDFILL

CLOSURE AND POST CLOSURE CARE PLAN

AUGUST, 1985

Hackensack Meadowlands Development Commission

One DeKorte Park Plaza

Lyndhurst, New Jersey 07071

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LIST OF EXHIBITS

Exhibit One:	Site 1-A Extension Engineering Plans; Dennis Backus, P.E.; December 1982; (Revised February, 1984)
Exhibit Two:	1-A Landfill Expansion Proposal; HMDC; December, 1982
Exhibit Three:	Topographic Map of Landfill Site 1-A; HMDC; March, 1985
Exhibit Four:	Leachate Containment and Collection System, Landfill 1-A, Kearny, New Jersey; Converse Consultants; January 1984
Exhibit Five:	Specifications and Proposals for Construction of Final Capping Site Improvements, HMDC 1-A Landfill, Kearny, New Jersey; HMDC
Exhibit Six:	Groundwater Monitoring Analysis for the 1-A Landfill - Annual Parameters; HMDC; April, 1984
Exhibit Seven:	Engineering Evaluation of Force Main Routing; Wehran Engineering; June, 1985
Exhibit Eight:	Sky Mound - Layout Plan, Progress Print; Nancy Holt and Cassandra Gates; June, 1985

1.0 INTRODUCTION

This Closure and Post Closure Care Plan has been prepared in fulfillment of the NJDEP requirements for the closure of the Site I-A Landfill, specifically N.J.A.C. 7:26-2.9. This shall supplement prior submissions including the "Site I-A Extension Engineering Plans" prepared by Dennis L. Backus, P.E., dated December, 1982, (and attached as Exhibit One) the "I-A Landfill Expansion Proposal" prepared by the HMDC and dated December 3, 1982, (and attached as Exhibit Two) and the "Interim Operational Plan for filling to 120 feet A.M.S.L." prepared by the HMDC and dated February 27, 1984.

1.1 PROJECT LOCATION

The project site consists of 53 acres of a 60 acre parcel known as Block 286, Lot 33, in the Town of Kearny, Hudson County, New Jersey.

The property is bounded on the north by the Belleville Turnpike (N.J. Route 7), on the east by an elevated section of the Amtrak Northeast Corridor Line, on the west by the eastern spur of the New Jersey Turnpike and by the PSE&G high tension lines, and on the south by a number of small, light density industrial uses which front on Harrison Avenue.

The site is accessible from Harrison Avenue via a timber bridge, and a 50 foot right-of-way. An area alongside this right-of-way was initially used for a checkers area, now serves for staging of future site improvements.

A topographic survey was flown in March, 1985 and is enclosed as Exhibit Three.

1.2 BACKGROUND

Under a prior lease agreement with the Town of Kearny, the Municipal Sanitary Landfill Authority (MSLA) utilized this site for landfilling for a number of years until November, 1974. This facility was known as the MSLA I-A Landfill (ID# 0907A) and was confined to approximately 53 acres of the approximately 60 acre site. Available topographic information of the site prior to initiation of HMDC operations on April 4, 1983, indicated that the highest point of the site was 40 feet above mean sea level (AMSL).

The DEP issued a Certification of Registration for the reactivation of landfill operations at the I-A site on March 8, 1983. Operations were conducted on the site by MSLA under contract to the HMDC from April 4, 1983 until April 28, 1984. Approximately 6,263,000 cubic yards of municipal solid waste were deposited on the site during this period based on rate averaging receipts. The operations were confined within the existing horizontal limits of the previous landfill operation. Topographic information from March 16, 1985 indicates that the final elevations were between 94 and 104 feet AMSL.

At the completion of their contract with the HMDC, MSLA installed a minimum of one foot of soil (intermediate cover) over the entire site. Further, the site was seeded in the late Fall of 1984 to stabilize this cover during the interim period prior to final capping. Additionally, landfill gas vents were installed at 200 feet on center along the southern and eastern landfill limits prior to closure.

Construction began in June, 1985 on a perimeter dike/cutoff wall which will contain leachate on-site for discharge to the PVSC wastewater treatment plant while also discharging runoff to a series of controlled outlet points.

2.0 CLOSURE PLAN

This section will address the improvements that will be installed at the I-A site to contain and control any adverse environmental effects of the HMDC landfill operation and the former MSLA operation. Further, additional items such as site access and end use will also be discussed.

2.1 SITE DRAINAGE

The area surrounding the landfill consists largely of wetlands which discharge to either the Passaic or Hackensack Rivers.

Stormwater run-off and other drainage water from the Kearny Meadowlands to the west of the site, enter the site at its northerly corner through a culvert under the New Jersey Turnpike. These surface waters flow around the site and eventually discharge to nearby marsh areas, and to the Hackensack River to the northeast of the site through a culvert under the Belleville Turnpike. This culvert crosses Belleville Turnpike at a distance of approximately 600 feet west of the Amtrak Railroad line.

Similarly, run-off and surface waters are discharged to marshes to the south through a culvert at the southwest corner of the site under Harrison Avenue. The Hudson County Mosquito Commission operates a series of pumps in these marshes that discharge to the Passaic River to the south.

None of these drainage patterns were changed as a result of the interim operation of the I-A Landfill, nor are they proposed to be changed when all site improvements are in place.

A dike/cutoff wall will incorporate a perimeter drainage swale on the inboard side of the cutoff wall. This swale discharges to fourteen (14) swale outlet and dispersion aprons that are located along the north, east, and west sides of the site. Therefore, runoff is prevented from discharging from the south slope onto the developed properties fronting on Harrison Avenue.

The plans for these improvements (Sheets 1 through 6) prepared by Converse Consultants, titled "Leachate Containment and Collection System, Landfill I-A, Kearny, New Jersey" and dated January 4, 1984, are attached as Exhibit Four. Specific details of the dike/cutoff wall are discussed in Section 2.6, Leachate Collection System.

2.2 SOIL EROSION AND SEDIMENT CONTROL PLAN

The Soil Erosion and Sediment Control Plan consists of improvements to be completed in conjunction with the leachate containment and collection system, as well as the final capping improvements for the site. Interim erosion and sediment control during construction shall consist of silt fences and/or hay bales.

Sediment will be controlled over the long-term through stone lined swales around the perimeter of the site and dispersion aprons at each of the fourteen discharge outlets. A perimeter maintenance road will be built at a minimum elevation of 9.75 feet AMSL in accordance with F.E.M.A. calculations for potential flood elevations at the site.

The final capping erosion controls shall consist of mulch over the newly seeded areas, the use of soil stabilization matting (where required), and sediment barriers (silt fences and/or hay bales) to prevent excessive erosion into the perimeter drainage swales.

2.3 FINAL COVER

The final cover, as approved by the DEP Certificate of Registration dated March 8, 1983, provides for two final cover profile options.

These are:

1. For the top (relatively flat) area only, a six (6) inch bed of sand would be installed over the existing intermediate cover, followed by a 20 mil PVC liner, then one (1) foot of sand, and six (6) inches of topsoil; or

2. For the top and/or side areas, a one (1) foot layer of 1x10-7 clay to be compacted over the existing intermediate cover, followed by six (6) inches of topsoil.

The existing intermediate cover subgrade shall be graded to a smooth contour to facilitate the placement of clay and its compaction. The area shall then be compacted with pneumatic rollers or other approved equipment.

If clay is utilized, it shall be spread evenly to provide a uniform, blended material free of clumps. The clay shall be compacted to at least 95% of the maximum density as determined to be in conformance with ASTM D698. The appropriate moisture content and dry unit weight, laboratory and field permeability tests shall also be performed.

The End Use Plan, proposed as a functional landfill artwork (see Section 2.9) will direct all drainage from the top of the landfill to an upper lined pond or ponds, with an overflow weir that will direct excess runoff to perimeter controls. The pond(s) will be lined with a synthetic geomembrane.

The HMDC will pursue the use of either wastewater sludge or compost in lieu of topsoil or as an amendment to the topsoil if acceptable to the DEP.

A draft of the Specifications for final capping is attached as Exhibit Five.

2.4 FINAL COVER VEGETATION

The final cover vegetation shall initially include grass seed mixtures, ground limestone, fertilizer and other materials to achieve a satisfactory stand of grass.

The seed mixture shall include Kentucky Bluegrass, Red Fescues, Redtop, and Perennial Ryegrass and may be placed using either a hydraulic method (hydroseeding) or a dry method with mechanical spreaders, etc.

As noted earlier, mulch and soil stabilization matting will be utilized where appropriate to prevent significant erosion.

In conjunction with the functional landfill artwork discussed in a later section of this report, a landscaping plan has been developed that includes plantings that have proven adaptability to landfill environments as well as stone or earthen access paths.

2.5 GROUNDWATER MONITORING WELLS

There are four (4) groundwater monitoring wells located on the site. These wells are sampled on a quarterly basis in accordance with the NJPDES permit for the site. The analysis of these samples is performed by the Hackensack Meadowlands Environment Center Laboratory and an outside lab (GC/MS analysis) and forwarded to the DEP Division of Water Resources, Bureau of Groundwater Discharge Permits.

A copy of the most recent annual analysis (January, 1985) is attached as Exhibit Six. Recent construction of the perimeter cutoff wall has destroyed three of these wells. The contractual agreement with the Contractor requires replacement of the wells at the completion of the work.

2.6 LEACHATE COLLECTION SYSTEM

The dike/cutoff wall under construction around the perimeter of the site will effectively contain all lateral migration of leachate from the site. The wall will be "keyed" into the relatively impermeable strata underlying the site. This strata includes varved silt, clayey silt, silty clay, and clay with occassional seams of fine sand. A permeability less than or equal to 1x10-7 cm/sec is the design requirement for this soil bentonite slurry wall.

A leachate collection drain will be constructed along the perimeter wall to collect leachate for discharge to a force main. This force main shall connect the I-A system to the Passaic Valley Sewage Commission (PVSC) plant in Newark, New Jersey.

The HMDC has retained Wehran Engineering to design the force main to the PVSC Plant. A copy of the most recent report is included as Exhibit Seven, entitled "Engineering Evaluation of Force Main Routing". Wehran Engineering; June, 1985.

The leachate collection drain shall consist of a perforated polyethelene pipe resting in a stone trench encapsulated in a geotextile. The invert of this pipe will vary between -1.5 feet and -4.5 below mean sea level to maintain an inflow condition.

The distance between manholes/cleanouts along this collection drain will not exceed 500 feet, and will allow for effective system maintenance.

For details of this system, refer to Sheets 2 and 3 of the plans attached as Exhibit Four.

2.7 LANDFILL GAS PROGRAM

The HMDC is pursuing an active landfill gas recovery project that will collect gas for commercial utilization. The project will be enhanced through the construction of the dike/cutoff wall (see Section 2.6), which in addition to containing the offsite migration of leachate, will also contain the landfill gases.

The HMDC is negotiating a contract with Getty Synthetic Fuels to recover the landfill gas. All activities are specified to be in full compliance with all applicable DEP regulations for air quality, etc.

In the event that the recovery of landfill gas is not a viable alternative, the HMDC shall install methane vents in accordance with the December, 1982 plans for the I-A site.

2.8 SITE ACCESS

As noted in previous sections of this report, the I-A landfill is bounded on three sides by marshes. Access is restricted to the southern boundary of the site facing Harrison Avenue.

Soon after completion of the cutoff wall, a six (6) foot high chain link fence with barbed wire will be erected. This fence will follow the outside of the perimeter cutoff wall along the south boundary. A gate will be located at the point where the present access road crosses the cutoff wall alignment.

2.9 END USE/FUNCTIONAL LANDFILL ARTWORK

The HMDC in an effort to comply with one of the mandates under it's enabling legislation, maximized the filling of the I-A site.

The site was filled from the toe-of-slope of the old landfill base, at a 3 (horizontal) to 1 (vertical) slope to an elevation of 70 feet AMSL. Above that elevation, filling progressed at a 4 (horizontal) to 1 (vertical) slope.

Given these physical limitations, it would not appear that the site would successfully be transformed into a park. However, the HMDC has hired a prominent designer/artist, Nancy Holt, to design a functional landfill artwork.

Using a combination of landscaping, the landfill gas recovery (or venting) system, and drainage controls, Nancy Holt will develop a functional landfill artwork. The plan includes the use of gravel paths that will be underlain by the required thicknesses of clay, and a protective six-inch layer of soil (topsoil, sand, etc.) to prevent erosion of the clay cap.

A copy of the plan for the site is attached as Exhibit Eight.

3.0 POST-CLOSURE CARE PLAN

In conjunction with the above noted improvements, the HMDC shall also maintain these improvements for a period of 30 years, unless this time-frame is reduced by the NJDEP to reflect actual field conditions.

During the first year following completion of each improvement listed below, the HMDC shall conduct monthly inspections of the site. After that time, quarterly inspections shall be performed.

3.1 SITE DRAINAGE PROGRAM

Inspect perimeter drainage channels and outfall structures. Identify any areas where corrective measures are required immediately or which will be required in the near future. Determine that ponds on the upper relatively flat portion of the landfill are effectively holding runoff and have not collected large amounts of silt. Clean as necessary. Inspect and clean weir controls.

3.2 SOIL EROSION AND SEDIMENT CONTROL

Check perimeter slopes for erosion, and outfalls and sedimentation basins for evidence of silt. Make recommendations, if necessary, for additional soil stabilization controls, seeding, rip-rap, etc., to reduce erosion.

3.3 FINAL COVER

Determine if erosion or other elements may compromise the integrity of the topsoil cover and/or the underlying clay cap. This includes perimeter inspection along the maintenance road, side slopes, and upper area of the landfill. As noted above, the ponds will be checked on the upper area as this too may effect final cover integrity. Maintain gravel paths as required, and restore areas where severe erosion has occurred.

3.4 FINAL COVER VEGETATION

Inspect the vegetative cover during growth seasons to determine adequacy of coverage, ability to withstand the landfill environment and shallow root zone, potentially long dry periods, ability to control erosion, and the ability of planted vegetation to withstand (if desireable) natural vegetative succession. Make recommendations to replace plantings as required.

3.5 GROUNDWATER MONITORING WELLS/PIEZOMETERS

Analyze the four groundwater monitoring wells for quarterly and annual parameters listed in Exhibit Six. Determine if well casings have been damaged or require maintenance. Contact experienced well driller, if necessary, for an inspection. Have laboratory report any indications of possible well failure to the HMDC.

Piezometers will be installed on either side of the dike/cutoff wall to determine the hydraulic gradient across the wall. Analyses shall be performed on a quarterly basis.

3.6 LEACHATE COLLECTION SYSTEM

Inspect collection system manholes/cleanouts to assure that there is a continuous flow in the system, and that no blockage has occurred between the manholes/cleanouts. Since the leachate collection system is composed of a perforated collection pipe within a gravel trench, it is unlikely that even with a break in the pipe, that leachate could be blocked.

3.7 LANDFILL GAS MONITORING

The contract with Getty Synthetic Fuels (GSF) will include a provision to monitor the perimeter of the landfill for off-site migration of landfill gas. In the event that unacceptable levels of landfill gas are detected at the perimeter, GSF will take the necessary precautions to control this migration. However, landfill gas migration away from the site is not anticipated with both a cutoff wall and an active landfill gas recovery system.

3.8 SITE ACCESS

Check fencing and access points along south (facing Harrison Avenue) property line for evidence of tampering or the need for replacement of fencing, gates and/or locks.

3.9 END USE/FUNCTIONAL LANDFILL ARTWORK

Maintain site improvements in accordance with the projected end use of the site, as well as the maintenance of the functional landfill artwork as directed by the artist after consultation and approval from the HMDC.

HACKENSACK MEADOWLANDS DEVELOPMENT COMMISSION

One DeKorte Park Plaza • Lyndhurst, New Jersey 07071
Administrative Offices: (201) 460-1700 Telephone: (201) 460-8300
Fax: (201) 460-1722

January 10, 1989

Mr. Timothy Doutt
N.J.D.E.P. - DWR
Bureau of Pretreatment & Residuals
401 East State Street
Trenton, New Jersey 08625

Re: Landfill Site 1-A Leachate Removal
NJPDES Permit No. NJ0053074

Dear Mr. Doutt:

As per our telephone conversation of January 5, 1989 regarding the Sludge Quality Assurance Regulations with respect to the above referenced facility, please be advised that this facility is a pumping station which handles filtered liquid from a landfill. There is no treatment of any kind at the site, therefore, there can be no sludge generation.

If you have any questions or comments, please call.

Very truly yours,

Paul J. Bove

Paul J. Bove, P.E.
Construction Manager

PJB/bc

cc: Victor Bullen
Thomas R. Marturano

HMDC LANDFILL SITE 1-A

LEACHATE QUANTITIES

DATE	GALLONS	DATE	GALLONS
October 3, 1988	75,000	December 2, 1988	67,500
October 4, 1988	67,500	December 3, 1988	142,500
October 5, 1988	45,000	December 6, 1988	52,500
October 8, 1988	97,500	December 7, 1988	58,500
October 11, 1988	52,500	December 9, 1988	67,500
October 12, 1988	52,500	December 12, 1988	66,000
October 13, 1988	45,000	December 13, 1988	123,000
October 14, 1988	37,500	December 14, 1988	82,500
October 17, 1988	60,000	December 15, 1988	94,500
October 19, 1988	82,500	December 17, 1988	73,500
October 20, 1988	45,000	December 21, 1988	82,500
October 21, 1988	67,500	December 22, 1988	45,000
October 24, 1988	105,000	December 23, 1988	135,000
October 25, 1988	52,500	December 27, 1988	90,000
October 26, 1988	30,000	December 28, 1988	115,500
October 27, 1988	37,500	December 29, 1988	121,500
October 28, 1988	96,000	December 30, 1988	147,000
October 31, 1988	87,000	December 31, 1988	100,500
November 3, 1988	95,500		
November 4, 1988	94,000	TOTAL	3,484,500
November 9, 1988	72,500		
November 14, 1988	29,000	AVG.	37,875
November 15, 1988	29,000		
November 19, 1988	95,500	MAX.	147,000
November 25, 1988	97,000		
November 29, 1988	81,500	MIN.	0
November 30, 1988	90,000		

acting to absorb some of excess nutrients being discharged into the water. Table 3-11 summarizes the results of the 9 separate nutrient balance studies that were undertaken in the District's wetlands.

3.4.3 Temperature

There are three power generating plants discharging "cooling" waters in excess of 100 degrees F into the lower Hackensack River (see Table 3-6). These discharges raise the water temperature in the river to over 90 degrees F during the summer months (CBA, 1990), which violates the state water quality criterion of 85 degrees F. The modeling of oxygen dynamics in the lower Hackensack River has shown that these thermal discharges contribute significantly to the low oxygen concentrations found in the Berrys Creek area (CBA, 1990). The warmer waters increase the rate of degradation (oxidation) of the BOD discharged by the wastewater treatment plants.

3.4.4 Toxics

A qualitative assessment of the existing land use in the watershed indicates that there is a significant potential for degradation of water quality from the discharges of toxic compounds. One concern is the leachate from the solid waste landfills that were built in, or adjacent to the wetlands in the District. Of the 12 major landfills in the District, leachate is controlled at only two: the Kingsland and the Kearny (1-A) landfills. Thus, of the approximately 1,400 acres of past and present undeveloped solid waste landfills in the District (HMDC, 1991) leachate is controlled from only 200 acres. The remaining 1,200 acres of solid waste fills are uncapped and leachate can drain directly into the creeks, wetlands and groundwater in the river basin.

The loadings of toxic materials in the leachate have not been monitored in all landfills, but data are available from the Harrison Avenue landfill in Kearny (1-A) to provide an estimate of the loadings of toxics that may be reaching the Hackensack River. The average concentration of toxic metals and petroleum hydrocarbons in four samples (taken monthly) in 1991 are given in Table 3-12. Assuming an average leaching rate of 540,000 to 670,000 gallons per acre per year for uncapped vegetated landfills (HMDC, 1991; K. Ochab, pers. comm.) the 1,200 acres of solid waste landfill that have no leachate control contribute significant amounts of toxic metals to the river basin annually based on the average concentrations measured (see Table 3-12). The highest loadings are petroleum hydrocarbons, zinc, nickel, and lead.

Ammonia is also toxic to fish and other aquatic organisms. Concentrations of ammonia acutely toxic to fish may cause loss of equilibrium, hyperexcitability, increased breathing, cardiac output and oxygen uptake, and in extreme cases, convulsions, coma, and death. At lower concentrations ammonia has many effects on fish, including a reduction in hatching success, reduction in growth rate and morphological development, and pathological changes in tissues of gills, livers, and kidneys. Factors that have been shown to affect ammonia toxicity include oxygen concentration, temperature, pH, previous acclimation to ammonia, fluctuating or intermittent exposures, carbon dioxide concentration, salinity, and the presence of other toxicants. Data for concentrations of ammonia toxic to freshwater phytoplankton and vascular plants, although limited, indicate that freshwater plant species are appreciably more tolerant to ammonia than are invertebrates or fish (EPA, Quality Criteria for Water, 1986).

(USEPA, 1995)

TABLE 3-12

CONCENTRATIONS OF TOXIC COMPOUNDS IN LANDFILL LEACHATE AND THE ESTIMATED ANNUAL LOADING TO THE HACKENSACK RIVER

Compound	Concentration in leachate[a] (ug/l)	Annual mass loading to river (kg/yr)
Petroleum Hydrocarbons[b]	1,300	2,200
Cadmium	49	83
Chromium	140	238
Copper	75	128
Lead	150	255
Nickel	199	338
Zinc	294	500
Arsenic	153	260

[a] HMDC leachate water quality data from Kearny for January, February, March 1991.
[b] Mean of 22 samples.

(tab3-12)

(USEPA, 1995)

APPENDIX D

Laboratory Analytical Report: Groundwater Samples August 16 -17, 2000

SEVERN TRENT SERVICES

STL Edison
777 New Durham Road
Edison, NJ 08817

Tel: 732-549-3900
Fax: 732-549-3679
www.stl-inc.com

September 7, 2000

JMZ Geology
43 Emery Avenue
Flemington, NJ 08822

Attention: Mr. Michael McGowan

Re: C863 - Kearny Smelting

Dear Mr. McGowan:

Enclosed are the results you requested for the following sample(s) received at our laboratory on August 15, 2000:

Lab No.	Client ID	Analysis Required
222955	MW-2S	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron
222956	MW-10S	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron
222957	MW-11S	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron

SEVERN TRENT SERVICES

Lab No.	Client ID	Analysis Required
222958	MW-5	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron
222959	MW-13	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron
222960	Field_Blank	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron
222961	MW-7S	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron
222962	MW-9S	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron

An invoice for our services is also enclosed. If you have any questions please contact your Project Manager, Deanna Doster, at (732) 549-3900.

Very truly yours,

Michael J. Urban
Laboratory Manager

SEVERN TRENT SERVICES

TABLE OF CONTENTS

SEVERN TRENT SERVICES

Client ID: MW-2S
Site: Kearny Smelting

Lab Sample No: 222955
Lab Job No: C863

Date Sampled: 08/15/00
Date Received: 08/15/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	21.0	0.40	P
Chromium	ND	1.1	P
Copper	ND	2.7	P
Lead	ND	2.1	P
Mercury	ND	0.10	CV
Nickel	8.0	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	792	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: MW-10S
Site: Kearny Smelting

Lab Sample No: 222956
Lab Job No: C863

Date Sampled: 08/15/00
Date Received: 08/15/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	9.8	3.6	P
Beryllium	ND	0.20	P
Cadmium	1.1	0.40	P
Chromium	ND	1.1	P
Copper	66.0	2.7	P
Lead	12.3	2.1	P
Mercury	ND	0.10	CV
Nickel	53.8	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	371	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN
TRENT
SERVICES

Client ID: MW-11S
Site: Kearny Smelting

Lab Sample No: 222957
Lab Job No: C863

Date Sampled: 08/15/00
Date Received: 08/15/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	ND	0.40	P
Chromium	3.1	1.1	P
Copper	118	2.7	P
Lead	11.5	2.1	P
Mercury	ND	0.10	CV
Nickel	4.6	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	75.0	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: MW-5
Site: Kearny Smelting

Lab Sample No: 222958
Lab Job No: C863

Date Sampled: 08/15/00
Date Received: 08/15/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	35.5	3.6	P
Beryllium	ND	0.20	P
Cadmium	1.1	0.40	P
Chromium	1.1	1.1	P
Copper	113	2.7	P
Lead	3.0	2.1	P
Mercury	0.81	0.10	CV
Nickel	360	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	541	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: MW-13
Site: Kearny Smelting

Lab Sample No: 222959
Lab Job No: C863

Date Sampled: 08/15/00
Date Received: 08/15/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	117	0.40	P
Chromium	ND	1.1	P
Copper	92.6	2.7	P
Lead	34.5	2.1	P
Mercury	0.15	0.10	CV
Nickel	27.0	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	6780	15.6	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: **Field Blank**
Site: **Kearny Smelting**

Lab Sample No: 222960
Lab Job No: C863

Date Sampled: 08/15/00
Date Received: 08/15/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	ND	0.40	P
Chromium	ND	1.1	P
Copper	ND	2.7	P
Lead	ND	2.1	P
Mercury	ND	0.10	CV
Nickel	ND	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	ND	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: MW-7S
Site: Kearny Smelting

Lab Sample No: 222961
Lab Job No: C863

Date Sampled: 08/15/00
Date Received: 08/15/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	5.3	0.40	P
Chromium	ND	1.1	P
Copper	29.0	2.7	P
Lead	ND	2.1	P
Mercury	ND	0.10	CV
Nickel	11.4	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	151	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: **MW-9S**
Site: **Kearny Smelting**

Lab Sample No: 222962
Lab Job No: C863

Date Sampled: 08/15/00
Date Received: 08/15/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	17.9	0.40	P
Chromium	ND	1.1	P
Copper	443	2.7	P
Lead	23.3	2.1	P
Mercury	0.62	0.10	CV
Nickel	61.5	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	9870	52.0	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C863

Date Sampled: 8/15/00
Date Received: 8/15/00
Matrix: WATER

Date Analyzed: 8/25/00
QA Batch: 1342

ALKALINITY

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
222955	MW-2S	2.0	275
222956	MW-10S	2.0	587
222957	MW-11S	1.0	551
222958	MW-5	1.0	458
222959	MW-13	1.0	268
222960	Field_Blank	1.0	ND
222961	MW-7S	1.0	453
222962	MW-9S	1.0	479

Quantitation Limit for Alkalinity is 5.0 mg/l.

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C863

Date Sampled: 8/15/00
Date Received: 8/15/00
Matrix: WATER

Date Analyzed: 8/21/00
QA Batch: 1380

FERROUS IRON

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
222955	MW-2S	1.0	ND
222956	MW-10S	5.0	8.3
222957	MW-11S	1.0	0.013
222958	MW-5	1.0	ND
222959	MW-13	1.0	ND
222960	Field_Blank	1.0	ND
222961	MW-7S	1.0	0.15
222962	MW-9S	1.0	ND

Quantitation Limit for Ferrous Iron is 0.1 mg/l for an undiluted sample.

X-Method 3500-Fe (Standard Methods for the Examination of Water and Wastewater, 18th Edition) specifies that ferrous iron be determined at sampling site because of the possibility of change in the ferrous-ferric ratio with time in acid solutions p3-67.

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C863

Date Sampled: 8/15/00
Date Received: 8/15/00
Matrix: WATER

Date Analyzed: 8/27/00
QA Batch: 1431

SULFATE

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
222955	MW-2S	2.0	52.2
222956	MW-10S	4.0	93.5
222957	MW-11S	2.0	39.7
222958	MW-5	4.0	88.7
222959	MW-13	2.0	55.4
222960	Field_Blank	1.0	ND
222961	MW-7S	2.0	27.9
222962	MW-9S	4.0	87.2

Quantitation Limit for Sulfate is 5.0 mg/l.

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C863

Date Sampled: 8/15/00
Date Received: 8/15/00
Matrix: WATER

Date Analyzed: 8/18/00
QA Batch: 1731

TOTAL DISSOLVED SOLIDS

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
222955	MW-2S	1.0	408
222956	MW-10S	2.0	844
222957	MW-11S	1.0	648
222958	MW-5	1.0	734
222959	MW-13	1.0	420
222960	Field_Blank	1.0	ND
222961	MW-7S	1.0	676
222962	MW-9S	1.0	638

Quantitation Limit for Total Dissolved Solids is 10.0 mg/l.

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C863

Date Sampled: 8/15/00
Date Received: 8/15/00
Matrix: WATER

Date Analyzed: 8/17/00
QA Batch: 1552

TOTAL SUSPENDED SOLIDS

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
222955	MW-2S	1.0	ND
222956	MW-10S	1.0	15.0
222957	MW-11S	1.0	ND
222958	MW-5	1.0	ND
222959	MW-13	1.0	ND
222960	Field_Blank	1.0	ND
222961	MW-7S	1.0	13.0
222962	MW-9S	1.0	ND

Quantitation Limit for Total Suspended Solids is 10.0 mg/l.

SEVERN TRENT SERVICES

Monitoring Well Data

Client: JMZ Geology

Project: Kearny Smelting

Date Sampled: 8/15/00

Job No.: C863

Name of Analyst: Richard Toogood

Names & Signatures of Samplers: Richard Toogood

Matt Morse

SEVERN TRENT SERVICES

Client: JMZ Geology Project: Kearny Smelting

Job No: C863 Date Sampled: 8/15/00 Analyst: R. Toogood

LOW FLOW PURGE DATA

Sample location	Depth to Water Before Purge(ft)	Depth to Water After Purge(ft)	Purge Method	Purge time	Purge Volume (L)	Purge Rate (L/min.)	Pump / Sample Depth(ft)	Sample Time
MW11s	9.58	10.21	Peristaltic	11:39-11:57	3.7	0.24	10.75	11:58
MW5	7.71	7.71	Peristaltic	12:22-12:37	3.5	0.23	8.50	12:38
MW13	4.87	5.26	Peristaltic	13:00-13:24	8.9	0.37	8.10	13:25
MW7s	8.44	9.65	Peristaltic	13:44-13:59	3.9	0.26	10.20	14:00

MW11s

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.84	18.9	460	1.55	6.53	127.70
6	6.75	18.2	441	1.48	6.52	126.10
9	6.73	18.3	434	1.42	6.56	124.10
12	6.75	18.3	422	1.39	6.56	121.20
15	6.75	18.1	420	1.48	6.59	119.40

MW5

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.83	22.1	772	0.99	1.02	116.60
6	6.80	21.7	805	0.77	0.60	103.50
9	6.80	21.7	812	0.61	0.55	97.20
12	6.79	21.8	814	0.67	0.53	99.00
15	6.79	21.8	819	0.65	0.52	91.40

MW13

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	7.03	19.4	518	0.86	0.13	94.60
6	7.01	19.1	501	0.52	0.21	96.90
9	7.01	19.2	489	0.37	0.23	101.40
12	7.01	19.5	492	0.39	0.27	98.80
15	7.01	19.6	492	0.40	0.21	93.80
18	7.01	19.9	491	0.37	0.27	91.20
21	7.00	19.9	489	0.40	0.26	88.40
24	7.00	19.8	488	0.38	0.27	86.80

MW7s

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.95	22.1	660	2.80	0.62	-74.60
6	6.88	22.2	651	3.89	0.44	-72.20
9	6.84	22.6	646	3.98	0.52	-69.50
12	6.84	22.7	643	4.22	0.54	-72.80
15	6.84	22.7	640	3.98	0.53	-78.60

SEVERN
TRENT
SERVICES

Client: JMZ Geology **Project:** Kearny Smelting

Job No: C863 **Date Sampled:** 8/15/00 **Analyst:** R. Toogood

LOW FLOW PURGE DATA

Sample location	Depth to Water Before Purge(ft)	Depth to Water After Purge(ft)	Purge Method	Purge time	Purge Volume (L)	Purge Rate (L/min.)	Pump / Sample Depth(ft)	Sample Time
MW2s	2.20	2.24	Peristaltic	9:22-9:46	6.1	0.25	4.50	9:47
MW10s	9.65	9.92	Peristaltic	10:20-10:41	5.7	0.27	11.00	10:42
MW9s	6.45	7.09	Peristaltic	11:01-11:16	3.4	0.23	9.00	11:17

MW2s

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.61	22.2	927	2.08	0.79	14.40
6	6.70	22.3	897	1.88	0.53	0.80
9	6.83	22.3	875	0.97	0.41	-7.10
12	6.89	22.4	847	0.87	0.35	-8.30
15	6.92	22.5	834	0.64	0.30	-8.40
18	6.95	22.5	802	0.63	0.29	-9.20
21	6.95	22.5	791	0.68	0.29	-6.90
24	6.96	22.5	788	0.61	0.28	-7.20

MW10s

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.61	17.7	818	4.78	0.80	-5.00
6	6.56	17.4	824	3.74	0.66	-9.20
9	6.60	17.5	836	2.77	0.58	12.80
12	6.60	17.5	844	2.41	0.55	1.60
15	6.62	17.5	850	1.80	0.53	-5.90
18	6.62	17.5	852	1.85	0.51	-10.40
21	6.65	17.5	857	1.84	0.50	-15.50

MW9s

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.61	18.9	719	3.67	0.98	164.00
6	6.59	18.7	552	2.73	0.64	164.00
9	6.59	19.0	532	2.36	0.61	143.90
12	6.59	19.0	528	2.30	0.62	143.90
15	6.58	19.5	524	2.32	0.64	147.80

SEVERN TRENT SERVICES

STL Edison
777 New Durham Road
Edison, NJ 08817

Tel: 732-549-3900
Fax: 732-549-3679
www.stl-inc.com

September 7, 2000

JMZ Geology
43 Emery Avenue
Flemington, NJ 08822

Attention: Mr. Michael McGowan

Re: C895 - Kearny Smelting

Dear Mr. McGowan:

Enclosed are the results you requested for the following sample(s) received at our laboratory on August 16, 2000:

Lab No.	Client ID	Analysis Required
223234	MW-14	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron
223235	MW-4S	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron
223236	MW-12	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron

SEVERN TRENT SERVICES

Lab No.	Client ID	Analysis Required
223237	Dup	PP Metals TDS TSS Alkalinity Sulfate Ferrous Iron

An invoice for our services is also enclosed. If you have any questions please contact your Project Manager, Deanna Doster, at (732) 549-3900.

Very truly yours,

Michael J. Urban
Laboratory Manager

SEVERN TRENT SERVICES

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TRENT
SERVICES

Client ID: **MW-14**
Site: **Kearny Smelting**

Lab Sample No: 223234
Lab Job No: C895

Date Sampled: 08/16/00
Date Received: 08/16/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	4.6	3.6	P
Beryllium	ND	0.20	P
Cadmium	2.3	0.40	P
Chromium	3.9	1.1	P
Copper	372	2.7	P
Lead	152	2.1	P
Mercury	0.14	0.10	CV
Nickel	9.1	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	751	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: **MW-4S**
Site: **Kearny Smelting**

Lab Sample No: 223235
Lab Job No: C895

Date Sampled: 08/16/00
Date Received: 08/16/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	ND	0.40	P
Chromium	ND	1.1	P
Copper	8.5	2.7	P
Lead	ND	2.1	P
Mercury	ND	0.10	CV
Nickel	5.4	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	107	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: MW-12
Site: Kearny Smelting

Lab Sample No: 223236
Lab Job No: C895

Date Sampled: 08/16/00
Date Received: 08/16/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	ND	0.40	P
Chromium	ND	1.1	P
Copper	ND	2.7	P
Lead	ND	2.1	P
Mercury	ND	0.10	CV
Nickel	ND	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	9.1	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Client ID: Dup
Site: Kearny Smelting

Lab Sample No: 223237
Lab Job No: C895

Date Sampled: 08/16/00
Date Received: 08/16/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Antimony	ND	4.5	P
Arsenic	ND	3.6	P
Beryllium	ND	0.20	P
Cadmium	ND	0.40	P
Chromium	ND	1.1	P
Copper	3.1	2.7	P
Lead	ND	2.1	P
Mercury	ND	0.10	CV
Nickel	ND	1.4	P
Selenium	ND	4.5	P
Silver	ND	1.1	P
Thallium	ND	4.1	P
Zinc	9.7	5.2	P

M Column - Method Code (See Section 2 of Report)

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C895

Date Sampled: 8/16/00
Date Received: 8/16/00
Matrix: WATER

Date Analyzed: 8/25/00
QA Batch: 1341

ALKALINITY

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
223234	MW-14	1.0	173
223235	MW-4S	2.0	433
223236	MW-12	1.0	551
223237	Dup	1.0	556

Quantitation Limit for Alkalinity is 5.0 mg/l.

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C895

Date Sampled: 8/16/00
Date Received: 8/16/00
Matrix: WATER

Date Analyzed: 8/30/00
QA Batch: 1383

FERROUS IRON

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
223234	MW-14	1.0	ND
223235	MW-4S	1.0	ND
223236	MW-12	1.0	ND
223237	Dup	1.0	ND

Quantitation Limit for Ferrous Iron is 0.1 mg/l for an undiluted sample.

X-Method 3500-Fe (Standard Methods for the Examination of Water and Wastewater, 18th Edition) specifies that ferrous iron be determined at sampling site because of the possibility of change in the ferrous-ferric ratio with time in acid solutions p3-67.

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C895

Date Sampled: 8/16/00
Date Received: 8/16/00
Matrix: WATER

Date Analyzed: 8/27/00
QA Batch: 1431

SULFATE

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
223234	MW-14	1.0	ND
223235	MW-4S	1.0	ND
223236	MW-12	1.0	21.4
223237	Dup	1.0	21.0

Quantitation Limit for Sulfate is 5.0 mg/l.

SEVERN
TRENT
SERVICES

Site: Kearny Smelting

Lab Job No: C895

Date Sampled: 8/16/00
Date Received: 8/16/00
Matrix: WATER

Date Analyzed: 8/22/00
QA Batch: 1731

TOTAL DISSOLVED SOLIDS

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
223234	MW-14	1.0	266
223235	MW-4S	1.0	536
223236	MW-12	2.0	934
223237	Dup	2.0	940

Quantitation Limit for Total Dissolved Solids is 10.0 mg/l.

SEVERN TRENT SERVICES

Site: Kearny Smelting

Lab Job No: C895

Date Sampled: 8/16/00
Date Received: 8/16/00
Matrix: WATER

Date Analyzed: 8/17/00
QA Batch: 1552

TOTAL SUSPENDED SOLIDS

STL Edison Sample #	Client ID	Dilution Factor	Analytical Result Units: mg/l
223234	MW-14	1.0	ND
223235	MW-4S	1.0	17.0
223236	MW-12	1.0	ND
223237	Dup	1.0	ND

Quantitation Limit for Total Suspended Solids is 10.0 mg/l.

Monitoring Well Data

SEVERN TRENT SERVICES

Client: JMZ Geology

Project: Keamy Smelting

Date Sampled: 8/16/00

Job No.: C895

Name of Analyst: Richard Toogood

Names & Signatures of Samplers: Richard Toogood

Matt Morse

SEVERN TRENT SERVICES

Client: JMZ Geology Project: Kearny Smelting

Job No: C895 Date Sampled: 8/16/00 Analyst: R. Toogood

LOW FLOW PURGE DATA

Sample location	Depth to Water Before Purge(ft)	Depth to Water After Purge(ft)	Purge Method	Purge time	Purge Volume (L)	Purge Rate (L/min.)	Pump / Sample Depth(ft)	Sample Time
MW14	2.50	2.62	Peristaltic	8:51-9:39	21.4	0.45	5.00	9:40
MW4s	6.02	6.38	Peristaltic	10:03-10:42	10.9	0.28	7.50	10:43
MW12	2.58	2.79	Peristaltic	11:01-11:25	11.5	0.48	8.00	11:26

MW14

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.88	23.0	397	>1000	2.75	152.40
6	7.10	22.3	442	155.00	1.58	137.60
9	7.28	22.5	482	87.50	1.15	86.60
12	7.36	22.5	509	63.20	0.92	26.60
15	7.42	22.5	538	46.80	0.72	-42.80
18	7.45	22.5	558	35.70	0.61	-83.60
21	7.47	22.4	576	29.20	0.52	-106.00
24	7.49	22.5	585	25.10	0.47	-120.60
27	7.51	22.5	592	21.60	0.43	-129.90
30	7.51	22.4	597	20.60	0.42	-136.70
33	7.52	22.4	600	18.30	0.40	-142.30
36	7.53	22.4	600	17.80	0.39	-146.50
39	7.54	22.4	601	16.40	0.37	-149.90
42	7.55	22.4	601	14.80	0.35	-153.20
45	7.55	22.4	601	14.30	0.33	-157.30
48	7.56	22.4	600	13.50	0.33	-158.90

4S ~~*MW13*~~

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.54	24.0	641	3.76	0.52	-28.50
6	6.55	23.7	633	1.97	0.46	-16.40
9	6.55	23.8	625	1.55	0.42	-11.30
12	6.58	23.8	617	1.15	0.40	-34.00
15	6.58	23.8	612	1.18	0.38	-40.30
18	6.60	23.0	608	1.55	0.39	-53.70
21	6.63	23.0	598	1.02	0.38	-68.40
24	6.66	23.7	593	0.91	0.39	-97.60
27	6.70	23.7	586	1.03	0.38	-100.10
30	6.71	23.8	583	0.91	0.38	-102.70
33	6.73	23.8	577	0.67	0.38	-108.00
36	6.74	23.8	574	0.63	0.38	-110.00
39	6.74	23.8	572	0.61	0.37	-112.10

MW12

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.95	21.1	1038	2.47	0.33	-276.90
6	6.94	20.9	1116	1.60	0.26	-315.70
9	6.93	21.4	1160	1.45	0.23	-319.50
12	6.92	21.8	1199	1.56	0.22	-321.60
15	6.91	22.4	1223	1.88	0.20	-326.20
18	6.91	22.7	1239	2.26	0.19	-329.50
21	6.92	22.9	1248	2.18	0.19	-329.90
24	6.91	23.0	1254	2.29	0.19	-329.60

Client: JMZ Geology **Project:** Kearny Smelting

Job No: C895 **Date Sampled:** 8/16/00 **Analyst:** R. Toogood

LOW FLOW PURGE DATA

Sample location	Depth to Water Before Purge(ft)	Depth to Water After Purge(ft)	Purge Method	Purge time	Purge Volume (L)	Purge Rate (L/min.)	Pump / Sample Depth(ft)	Sample Time
MW14	2.50	2.62	Peristaltic	8.51-9.39	21.4	0.45	5.00	9:40
MW4s	6.02	6.38	Peristaltic	10:03-10:42	10.9	0.28	7.50	10:43
MW12	2.58	2.79	Peristaltic	11:01-11:25	11.6	0.48	8.00	11:25

MW14

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.88	23.0	397	>1000	2.75	152.40
6	7.10	22.3	442	155.00	1.58	137.60
9	7.28	22.5	482	87.50	1.15	86.60
12	7.36	22.5	509	63.20	0.92	26.60
15	7.42	22.5	538	46.80	0.72	-42.80
18	7.45	22.5	558	35.70	0.61	-83.60
21	7.47	22.4	576	29.20	0.52	-106.00
24	7.49	22.5	585	25.10	0.47	-120.60
27	7.51	22.5	592	21.60	0.43	-129.90
30	7.51	22.4	597	20.60	0.42	-136.70
33	7.52	22.4	600	18.30	0.40	-142.30
36	7.53	22.4	600	17.80	0.39	-146.50
39	7.54	22.4	601	16.40	0.37	-149.90
42	7.55	22.4	601	14.80	0.35	-153.20
45	7.55	22.4	601	14.30	0.33	-157.30
48	7.56	22.4	600	13.50	0.33	-158.90

MW4s

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.54	24.0	641	3.76	0.52	-28.50
6	6.55	23.7	633	1.97	0.46	-16.40
9	6.55	23.8	625	1.55	0.42	-11.30
12	6.58	23.8	617	1.15	0.40	-34.00
15	6.58	23.8	612	1.18	0.36	-40.30
18	6.60	23.0	608	1.55	0.39	-53.70
21	6.63	23.0	598	1.02	0.38	-68.40
24	6.66	23.7	593	0.91	0.39	-97.60
27	6.70	23.7	586	1.03	0.38	-100.10
30	6.71	23.8	583	0.91	0.38	-102.70
33	6.73	23.8	577	0.67	0.38	-108.00
36	6.74	23.8	574	0.63	0.38	-110.00
39	6.74	23.8	572	0.61	0.37	-112.10

MW12

Time (min)	pH	Temp (°C)	Cond. (umhos)	Turbidity (NTU)	DO (mg/L)	Redox (mV)
3	6.95	21.1	1038	2.47	0.33	-276.90
6	6.94	20.9	1116	1.60	0.26	-315.70
9	6.93	21.4	1160	1.45	0.23	-319.50
12	6.92	21.8	1199	1.56	0.22	-321.60
15	6.91	22.4	1223	1.88	0.20	-326.20
18	6.91	22.7	1239	2.26	0.19	-329.50
21	6.92	22.9	1248	2.18	0.19	-329.90
24	6.91	23.0	1254	2.29	0.19	-329.60

SEVERN TRENT SERVICES

STL Edison
777 New Durham Road
Edison, NJ 08817

Tel: 732-549-3900
Fax: 732-549-3679
www.stl-inc.com

September 26, 2000

JMZ Geology
43 Emery Avenue
Flemington, NJ 08822

Attention: Mr. Michael McGowan

Re: D724 - Kearny Smelting

Dear Mr. McGowan:

Enclosed are the results you requested for the following sample(s) received at our laboratory on August 16, 2000:

Lab No.	Client ID	Analysis Required
228907	MW-14	Pb

An invoice for our services is also enclosed. If you have any questions please contact your Project Manager, Deanna Doster, at (732) 549-3900.

Very truly yours,

Michael J. Urban
Laboratory Manager

SEVERN TRENT SERVICES

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SEVERN TRENT SERVICES

Client ID: **MW-14**
Site: **Kearny Smelting**

Lab Sample No: 228907
Lab Job No: D724

Date Sampled: 08/16/00
Date Received: 08/16/00

Matrix: WATER
Level: LOW

METALS ANALYSIS

Analyte	Analytical Result Units: ug/l	Instrument Detection Limit	M
Lead	3.5	0.90	F

M Column - Method Code (See Section 2 of Report)

APPENDIX E

Attenuation Rate Calculations

KEARNY SMELTING AND REFINING CORP.

ATTENUATION RATE CALCULATIONS

I. Calculations based on analytical results fro March 8 - 10, 1999 sampling event.

1. Distances between wells (feet):

MW-9 to MW-10 = 190
MW-9 to MW-11 = 192
MW-13 to MW-14 = 228
MW-13 to MW-5 = 255
MW-13 to MW-7S = 118

2. Contaminant concentrations (ug/l):

Well	Cd	Pb	Zn
MW-5	0.88	2.1	743
MW-7S	1.5	ND	103
MW-9	12.2	10.3	8520
MW-10	0.56	3.5	580
MW-11	ND	ND	57.5
MW-13	81.1	25.9	4270
MW-14	ND	ND	8.8

3. Attenuation Rate Calculations:

A. MW-9 to MW-10

Cd: 12.2 - 0.56 = 11.64 ug/l reduction
11.64 ug/l ÷ 190 feet = 0.06 ug/l/ft

Pb: 10.3 - 3.5 = 6.8 ug/l reduction
6.8 ug/l ÷ 190 feet = 0.03 ug/l/ft

Zn: 8520 - 580 = 7940 ug/l reduction
7940 ug/l ÷ 190 feet = 41.7 ug/l/ft

B. MW-9 to MW-11

Cd: 12.2 - 0.0 = 12.2 ug/l reduction
12.2 ug/l ÷ 192 feet = 0.06 ug/l/ft

Pb: 10.3 - 0.0 = 10.3 ug/l reduction
10.3 ug/l ÷ 192 feet = 0.05 ug/l/ft

Zn: 8520 - 57.5 = 8462 ug/l reduction
8462 ug/l ÷ 192 feet = 44 ug/l/ft

C. MW-13 to MW-14

Cd: 81.1 - 0.0 = 81.1 ug/l reduction
81.1 ug/l ÷ 228 feet = 0.36 ug/l/ft

Pb: 25.9 - 0.0 = 25.9 ug/l reduction
25.9 ug/l ÷ 228 feet = 0.1 ug/l/ft

Zn: 4270 - 8.8 = 4261 ug/l reduction
4261 ug/l ÷ 228 feet = 18.7 ug/l/ft

D. MW-13 to MW-5

Cd: 81.1 - 0.88 = 80.2 ug/l reduction
80.2 ug/l ÷ 255 feet = 0.31ug/l/ft

Pb: 25.9 - 2.1 = 23.8 ug/l reduction
23.8 ug/l ÷ 255 feet = 0.9 ug/l/ft

Zn: 4270 - 743 = 3527 ug/l reduction
3527 ug/l ÷ 255 feet = 13 ug/l/ft

E: MW-13 to MW-7S

Cd: 81.1 - 2.4 = 78.7 ug/l reduction
78.7 ug/l ÷ 118 feet = 0.66 ug/l/ft

Pb: 25.9 - 0.0 = 25.9 ug/l reduction
25.9 ug/l ÷ 118 feet = 0.21 ug/l/ft

Zn: 4270 - 103 = 4167 ug/l reduction
4167 ug/l ÷ 118 feet = 39.3 ug/l/ft

4. Migration of Cd downgradient of MW-2

Cd concentration = 10.6 ug/l (March 1999)
attenuation rate = 0.06 ug/l/ft (MW-9 to MW-10 & MW-11)

To reduce Cd to 4.0 (GWQC): rate x distance = reduction
0.06 ug/l/ft (X) = 6.6
X = 110 feet

II. Calculations based on analytical results for August 16 - 17, 2000 sampling event.

1. Distances between wells:

MW-9 to MW-10 = 190 feet
MW-9 to MW-11 = 192 feet
MW-13 to MW-14 = 228 feet
MW-13 to MW-5 = 255 feet
MW-13 to MW-7S = 118 feet

2. Contaminant concentrations (ug/l):

Well	Cd	Pb	Zn
MW-5	1.1	3	541
MW-7S	5.3	ND	151
MW-9	17.9	23.3	9870
MW-10	1.1	12.3	371
MW-11	ND	11.5	75
MW-13	117	34.5	6780
MW-14	2.3	3.5	751

3. Attenuation rate calculations:

A. MW-9 to MW-10

Cd: 17.9 -1.1 = 16.8 ug/l reduction
16.8 ÷ 190 feet = 0.09 ug/l/ft

Pb: 23.3 - 12.3 = 11 ug/l reduction
11 ÷ 190 feet = 0.06 ug/l/ft

Zn: 9870 - 371 = 9499 ug/l reduction
9499 ÷ 190 feet = 49.9 ug/l/ft

B. MW-9 to MW-11

Cd: 17.9 - 0.0 = 17.9 ug/l reduction
17.9 ÷ 192 feet = 0.09 ug/l/ft

Pb: 23.3 - 11.5 = 11.8 ug/l reduction
11.8 ÷ 192 feet = 0.06 ug/l/ft

Zn: 9870 - 75 = 9795 ug/l reduction
9795 ÷ 192 feet = 51 ug/l/ft

C. MW-13 to MW-14

Cd: 117 - 2.3 = 114.7 ug/l reduction
114.7 ÷ 228 feet = 0.5 ug/l/ft

Pb: 34.5 - 3.5 = 31 ug/l reduction
31 ÷ 228 feet = 0.13 ug/l/ft

Zn: 6780 - 751 = 6029 ug/l reduction
6029 ÷ 228 feet = 26 ug/l/ft

D. MW-13 to MW-5

Cd: 117 - 1.1 = 115.9 ug/l reduction
115.9 ÷ 255 feet = 0.45 ug/l/ft

Pb: 34.5 - 3 = 31.5 ug/l reduction
31.5 ÷ 255 feet = 0.12 ug/l/ft

Zn: 6780 - 541 = 6239 ug/l reduction
6239 ÷ 255 feet = 24.5 ug/l/ft

E. MW-13 to MW-7S

Cd: 117 - 5.3 = 111.7 ug/l reduction
111.7 ÷ 118 feet = 0.94 ug/l/ft

Pb: 34.5 - 0.0 = 34.5 ug/l reduction
34.5 ÷ 118 feet = 0.29 ug/l/ft

Zn 6780 - 151 = 6629 ug/l reduction
6629 ÷ 118 feet = 56 ug/l/ft

4. Contaminant migration:

To reduce 21 ug/l Cd at MW-2 to 4.0 (GWQC):

rate x distance = reduction
0.09 ug/l/ft (X) = 17
X = 188 feet

To reduce 12.3 ug/l Pb at MW-10 to 10 (GWQC):

rate x distance = reduction
0.06 ug/l/ft (X) = 2.3
X = 38 feet

To reduce 11.5 ug/l Pb at MW-10 to 10 (GWQC):

rate x distance = reduction

0.06 ug/l/ft (X) = 1.5

X = 25 feet

To reduce 5.3 ug/l Cd at MW-7S to 4.0 (GWQC):

rate x distance = reduction

0.09 ug/l/ft (X) = 1.3

X = 14 feet

Calculation of the ratio of copper to arsenic (mass basis) in "Paris Green" (copper acetoarsenate):

Formula: $(CuO)_3As_2O_3 . Cu(Cu_2H_3O_2)_2$

Element	Atom. Mass		Mol. Prop.		Mol. Mass	Mass %
Cu	63.546	x	8	=	508.368	61.676%
As	74.9216	x	2	=	149.843	18.179%
O	15.9994	x	10	=	159.994	19.411%
H	1.0079	x	6	=	6.047	0.734%
		Total Mol. Mass		=	824.253	

Cu/As = 3.393

APPENDIX F

CEA Fact Sheet and Documentation

CLASSIFICATION EXCEPTION AREA/WELL RESTRICTION AREA
FACT SHEET

DATE: September 25, 2000

SITE NAME: Kearny Smelting and Refining Corporation
936 Harrison Avenue
Kearny, Hudson County, New Jersey

BLOCK & LOT: Block 275, Lots 1B & 2A
Block 276, Lots 1B, 1C, & 3

SITE LOCATION MAP: See Exhibit A

SITE CONTACT: Ms. Francine Rothschild
ADDRESS: Kearny Smelting and Refining Corporation
936 Harrison Avenue
Kearny, NJ 07029
PHONE: 201-991-7276

CASE NUMBER: Not applicable

NJDEP LEAD PROGRAM: Division of Responsible Party Site Remediation
Bureau of State Case Management
Case Manager: Mr. Ian Curtis
Phone: 609-633-7232

DESCRIPTION OF CLASSIFICATION EXCEPTION AREA (CEA):

1. Identification of affected aquifer:

The affected aquifer consists of anthropogenic fill materials and the underlying Pleistocene glacio-fluvial sands and silts. These two units are separated locally by a discontinuous peat layer (meadow mat).

Pursuant to NJAC 7:9-6.5, this area is presently designated as Class II-A. The primary designated use for Class II-A groundwater is potable water; secondary uses include agricultural and industrial water. Any proposed groundwater use within the CEA will require NJDEP review for feasibility of well installation and modifications that would be protect against adverse affects from the specified contaminants for the duration of the CEA.

2. Contaminants exceeding constituent standards and applicable standards:

This CEA/WRA applies only to the contaminants listed in the table below. The GWQC and primary drinking water standards for these contaminants are listed in ug/l. All constituent standards (NJAC 7:9-6) apply at the designated boundary.

CONTAMINANT	GWQC (ug/l)	PRIMARY DRINKING WATER STANDARD: Maximum Contaminant Level (MCL) (ug/l)
Cadmium (Cd)	4	5
Lead (Pb)	10	15*
Zinc (Zn)	5000	5000**

NOTES: GWQC = higher of NJDEP Groundwater Quality Criteria or PQLs, 5/15/1995.
* value is an action level not an MCL.
** secondary standard.

3. CEA Boundaries:

Horizontal Boundaries: Property line (see Exhibit B, CEA Map and metes & Bounds description of property).

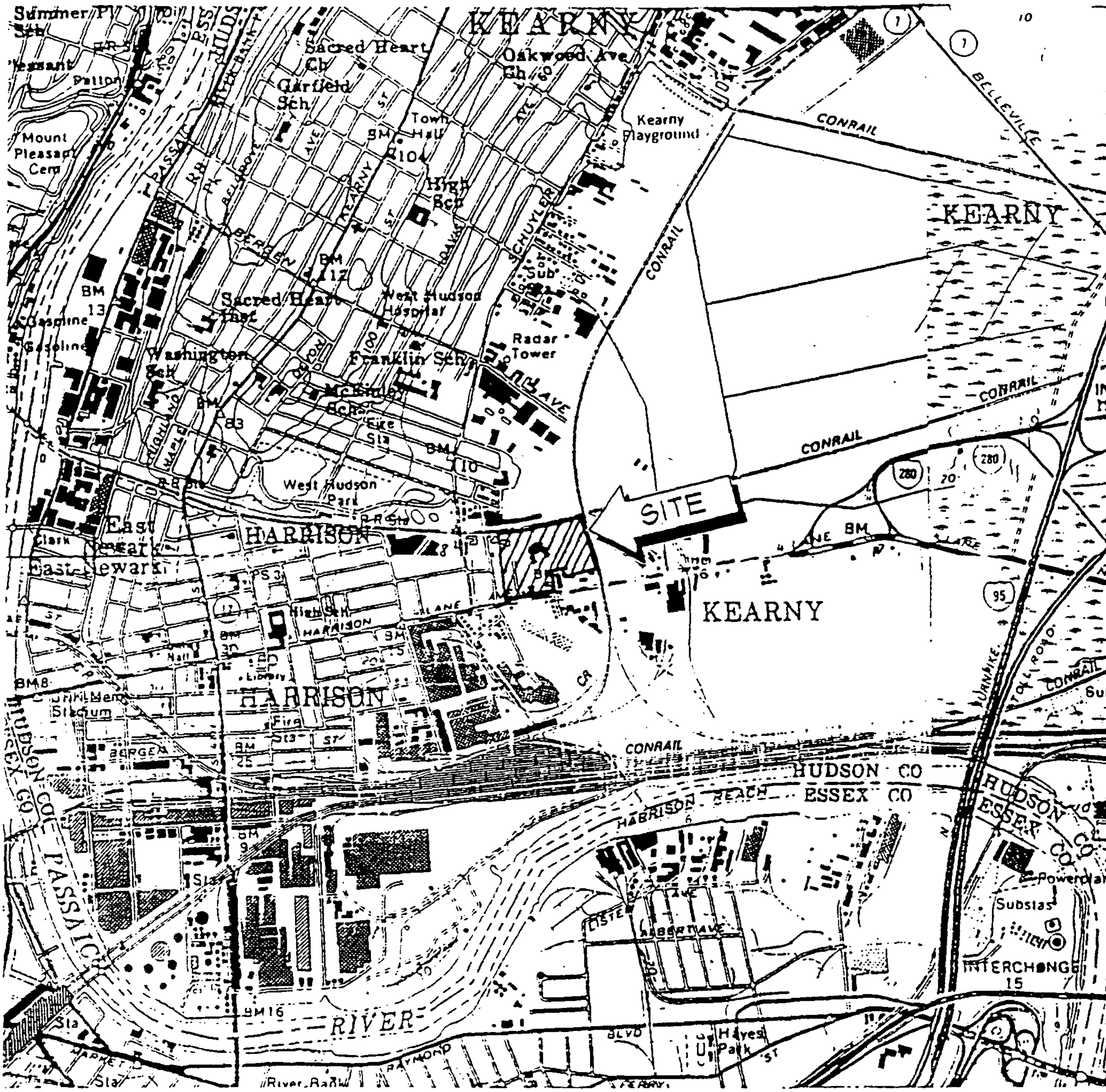
Vertical Boundaries: Ground surface through the basal contact of the Pleistocene glacio-fluvial deposits.

4. Projected term of CEA: Indeterminate.

Note: Since groundwater quality data indicates exceedances of contaminants above the Primary Drinking Water Standards, and the designated uses of Class II-A aquifers include potable use, the CEA established for this site is also a Well Restriction Area (WRA). The extent of the WRA shall coincide with the boundaries of the CEA.

EXHIBIT A

Site Location Map



SCALE 1:24000

1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTUOR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MN GN
213 MILS 6 MILS

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SOURCE: U.S.G.S. WEEHAWKEN, ELIZABETH JERSEY CITY, ORANGE QUADRANGLES

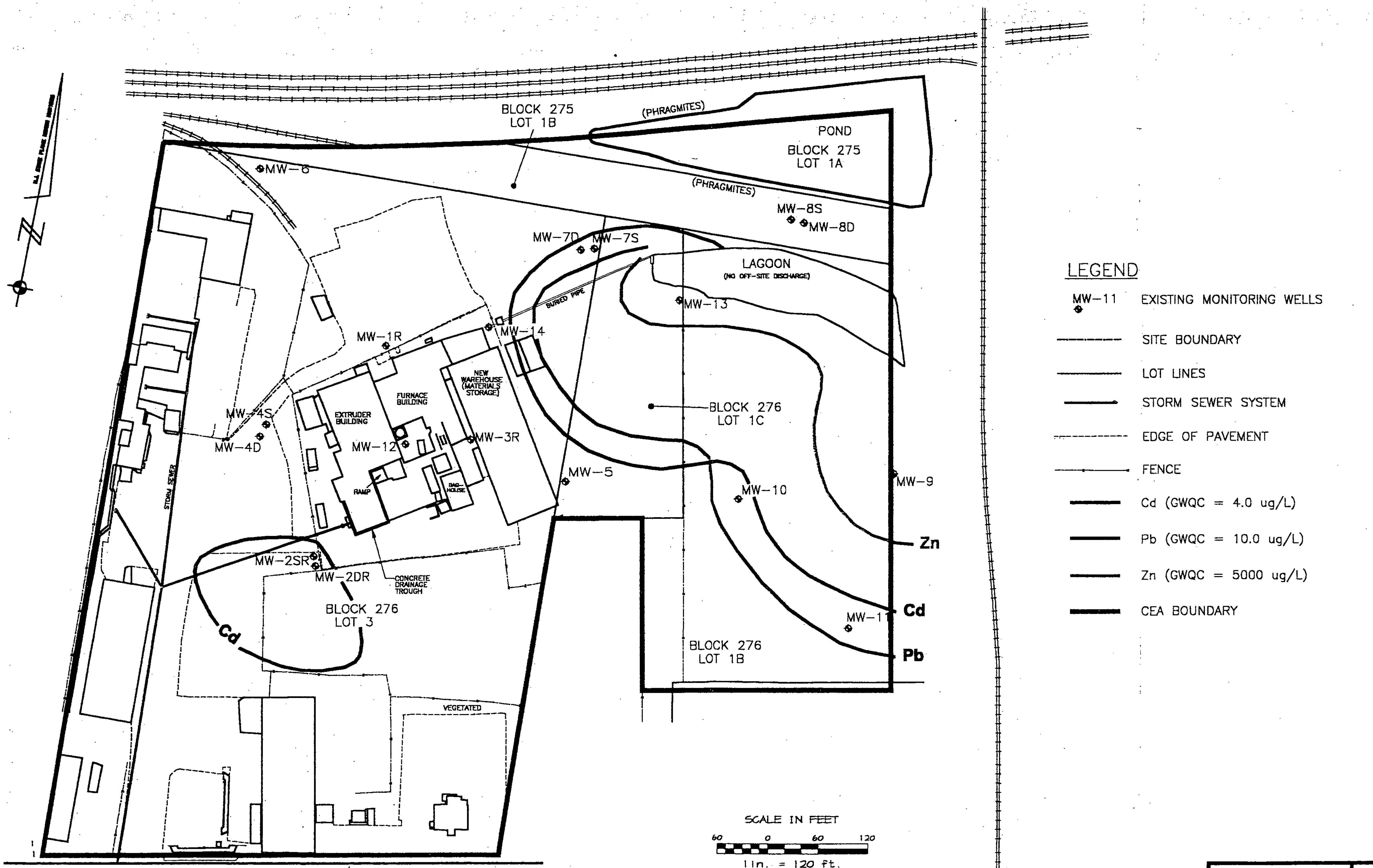
JMZ GEOLOGY	KEARNY SMELTING

FIGURE 1:
SITE LOCATION MAP

RIWP 10/95

EXHIBIT B

CEA Map and Metes & Bounds Description of Property



BASE MAP BY: HENDERSON AND BODWELL, LLP, CONSULTING ENGINEERS
BOUNDARY AND TOPOGRAPHIC SURVEY OF TAX MAP LOTS 1B & 2A IN BLOCK 275
AND LOTS 1B,1C & 3 IN BLOCK 276 FOR KEARNY SMELTING AND REFINING CORP.
DWG.NO. NJ227-1050, SHEET 1 OF 1, 11/16/95

JMZ GEOLOGY	KSRC

FIGURE 14:
CEA MAP

Rev. 9/00

Metes and Bounds Description - Block 275, Lot 1B

I. PROPERTY DESCRIPTION

Block 275, Lots 2A and 1B form a triangular area on the northern side of the site. Lot 1B represents the original bed of the Newark and Hudson Railroad; Lot 2A represents the area between the original Newark and Hudson Railroad and the 1905 Branch of the Erie Railroad to the north. Most of Lot 2A is occupied by a pond. These two lots were the property of the Erie Railroad (Conrail) until 1983 when they were purchased by Joseph Supor. In 1986 they were acquired by M. Rothschild and were subsequently combined into a single lot designated Block 275, Lot 1B.

II. DEED DESCRIPTION

BEGINNING at a point on the southerly right of way line of the Consolidated Rail Corporation's (New Newark Branch) where it intersects the southerly right of way line of the former Erie Lackawanna Railway Company's Old Newark Branch, said point also being 90.00 feet more or less, southerly and at right angles from the monumented baseline of the Consolidated Rail Corporation's New Newark Branch, opposite Valuation Chaining Station 364 + 80 more or less;

(1) thence southeasterly, along the southerly line of the Former Erie Lackawanna Railway Company's Old Newark Branch, a distance of 735.00 feet more or less to a point on the westerly right of way line of Consolidated Rail Corporation's Kingsland Brànch, said point also being 255.00 feet more or less, southerly and at right angles to the Consolidated Rail Corporation's New Newark Branch's monumented baseline, opposite Valuation Chanining Station 357 + 80 more or less;

(2) thence, northerly, along the said westerly right of way line of the Consolidated Rail Corporation's Kingsland Branch, a distance of 185.00 feet more or less, to a point on the southerly right of way line of Conrail's New Newark Branch said point also being 70.00 feet more or less southerly and at right angles to Consolidated Rail Corporation's New Newark Branch's monumented baseline, opposite Valuation Chaining Station 357 +65 more or less;

(3) thence westerly along the Consolidated Rail Corporation's southerly right of way of their New Newark Branch, a distance of 730.00 feet more or less to a point the true place of beginning. Said described parcel contains 1.55 acres more or less.

BEING also known as Lot 2A in Block 275 on the current tax Map of the Town of Kearny.

BEING the same premises conveyed to the grantor herein by deed from Erie Lackawanna, Inc., a Delaware corporation, dated December 9, 1983 and recorded February 21, 1984 in the Office of the Hudson County Register in Deed Book 3404 page 670 on February 21, 1984.

Said premises being further described in accordance with a survey made by Borrie, McDonald & Watson, dated January 10, 1986, as follows:

BEGINNING at a point in the westerly right-of-way line of lands; now or formerly Erie Lackawanna Railroad, Harrison-Kingsland Branch, at a point therein distant 702.90 feet, on a course of north 3 degrees 48 minutes 15 seconds West, from the northerly line of Harrison Avenue; thence (1) north 3 degrees 48 minutes 15 seconds west, along said railroad 184.53 feet to the southerly right of way line of lands, now or formerly, Erie Lackawanna Railroad, Newark & Hudson branch; thence (2) South 81 degrees 09 minutes 45 seconds West, along said railroad 316.44 feet to a point of curve; thence (3) southwesterly, still along said railroad, on a curve to the right, having a radius of 3894.83 feet and an arc distance of 554.55 feet to a point in the former southerly line of lands of the old Erie Lackawanna Railroad, Newark & Hudson Branch; thence (4) south 84 degrees 10 minutes 15 seconds east, along former line of said railroad 881.64 feet to the point and place of beginning.

Parcel contains 70,318 square feet or 1.61 acres.

Metes and Bounds Description - Block 276, Lot 3

BEGINNING in the northerly line of Harrison Avenue (formerly called Turnpike Road leading from Newark to New York) where the same is intersected by the easterly line of a tract of land now or formerly belonging to Thomas Watkins, and from thence running:

(1) Along said northerly line of Harrison Avenue, North 84 degrees 25 minutes East 541.42 feet to a point therein, which point is also distant 589.90 feet from the intersection of the said northerly line of Harrison Avenue with the center line of the Delaware, Lackawanna & Western Railroad; thence;

(2) North 4 degrees East 772.42 feet to the southerly line of the right of way of the Erie Railroad (formerly Newark and Hudson Railroad); thence

(3) Along the same South 4 degrees West 862.87 feet to the northerly line of Harrison Avenue and the place of BEGINNING.

The said premises being that part of the premises conveyed to Grantor and designated as First Tract in the deed to Grantor made by Henry Samuel and Bertha Samuel, his wife, dated December 29, 1922 and recorded March 31, 1923 in the Hudson County Register's office in Deed Book 1473, page 446 and by merger of Hensam Realty Co., a New Jersey corporation, with Grantor on November 25, 1968.

Metes and Bounds Description - Block 276, Lot 1C

BEGINNING at a point which is established as follows:

BEGINNING at a point along the southerly right-of-way along the Erie-Lackawanna Railroad, Newark and Hudson Branch Railroad, thence;

(1) East 84 degrees, 10 minutes, 15 seconds south 93.06 feet, thence;

(2) South 3 degrees, 48 minutes, 15 seconds east 345.28 feet, thence;

(3) West 86 degrees 11 minutes, 45 seconds south 152.62 feet, thence;

(4) North 5 degrees 46 minutes, 45 seconds east for a distance of 365.96 feet.

Parcel contains 43, 386 square feet or 0.996 acres.